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OEL Maintenance Manual

ML280 elite

Revision 6

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PREFACE

This maintenance manual describes how to maintain the PD431 printer in the field.

This manual is for customer engineers.

For further information, refer to the Users Manual for handling or operating the equipment.

The relation between the destination point and the model name of this printer is as follows.

Destination point	PD431
For ODA	ML186
For INT	ML184 Turbo+
For OEL	ML280 Elite

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1. CONFIGURATION

1.1 Standard Printer Configuration

The standard configuration of the PD431 is as follows:

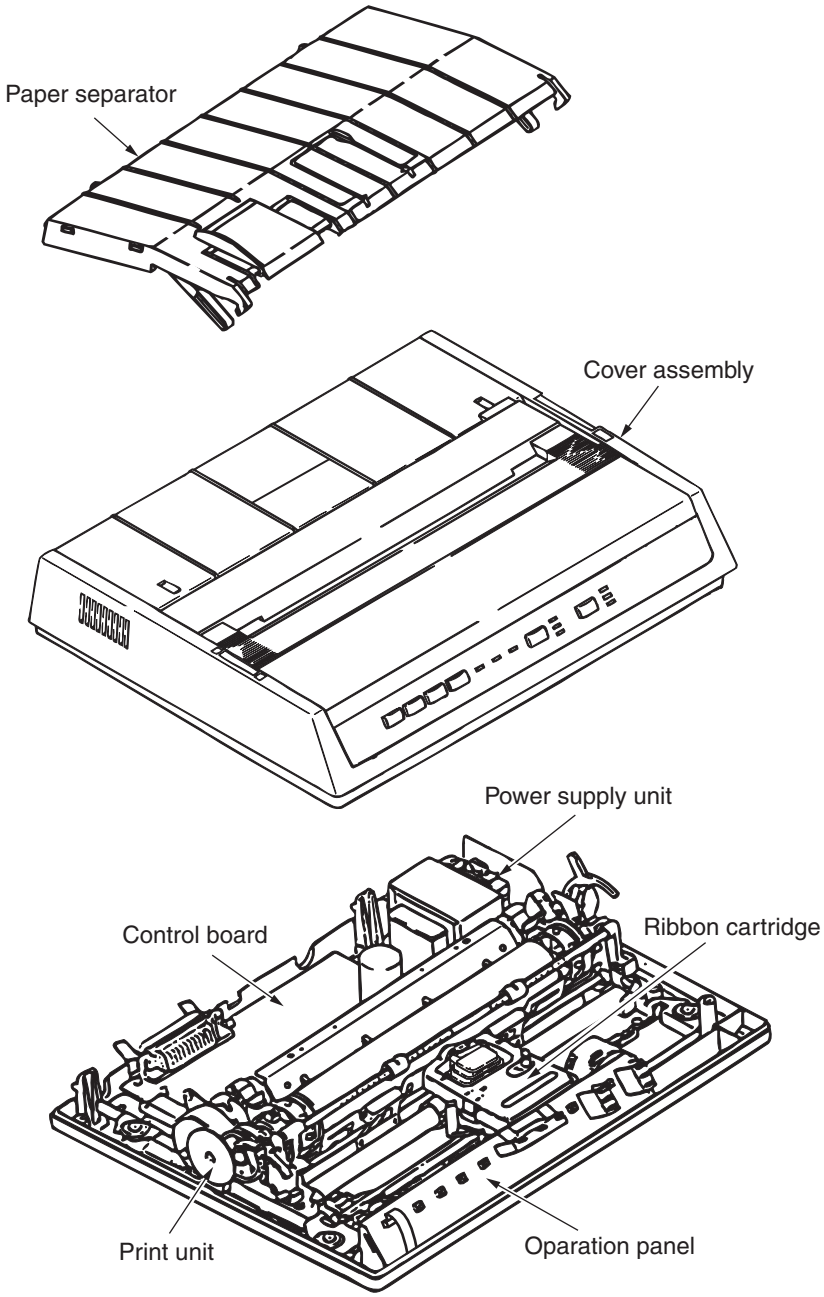
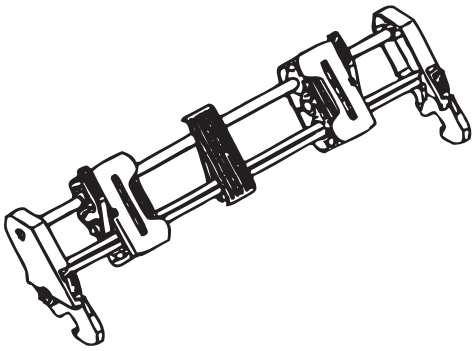


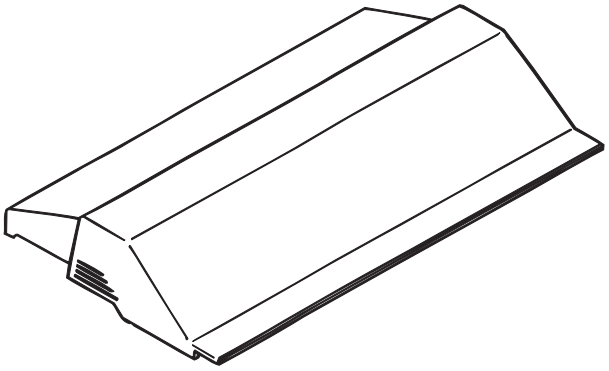
Figure 1-1. Printer Configuration

1.2 Options

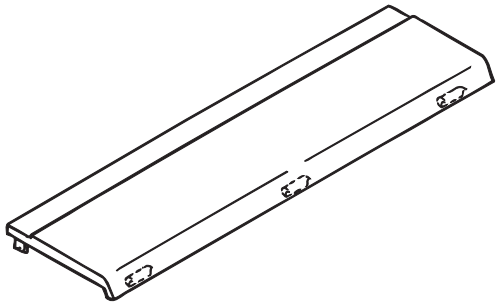
(1) Tractor unit (consists of Pin tractor assy, acoustic cover, and access cover)



Pin tractor assembly

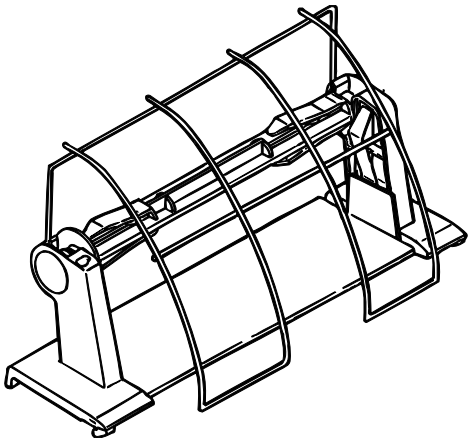


Acoustic cover

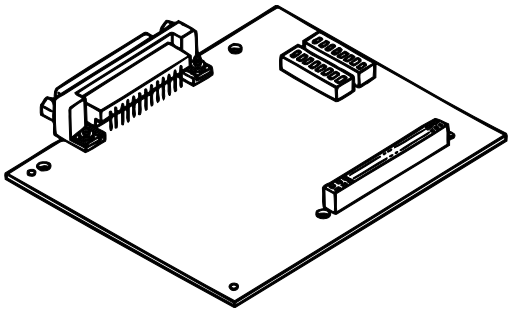


Access cover

(2) Roll paper stand



(3) Super-speed RS232-C serial interface board



2. THEORY OF OPERATION

2.1 Electrical Operation

This section describes the operation of the printer circuits.

2.1.1 General

The electrical section of the printer consists of the components shown in figure1.

In addition to the microprocessor, the control board also contains a AC power circuit, drive circuits, a paper-end sensor, a parallel interface connector, and an USB interface connector.

The power supply connects with the control circuit board via a cable, end other electrical parts connect via a cable.

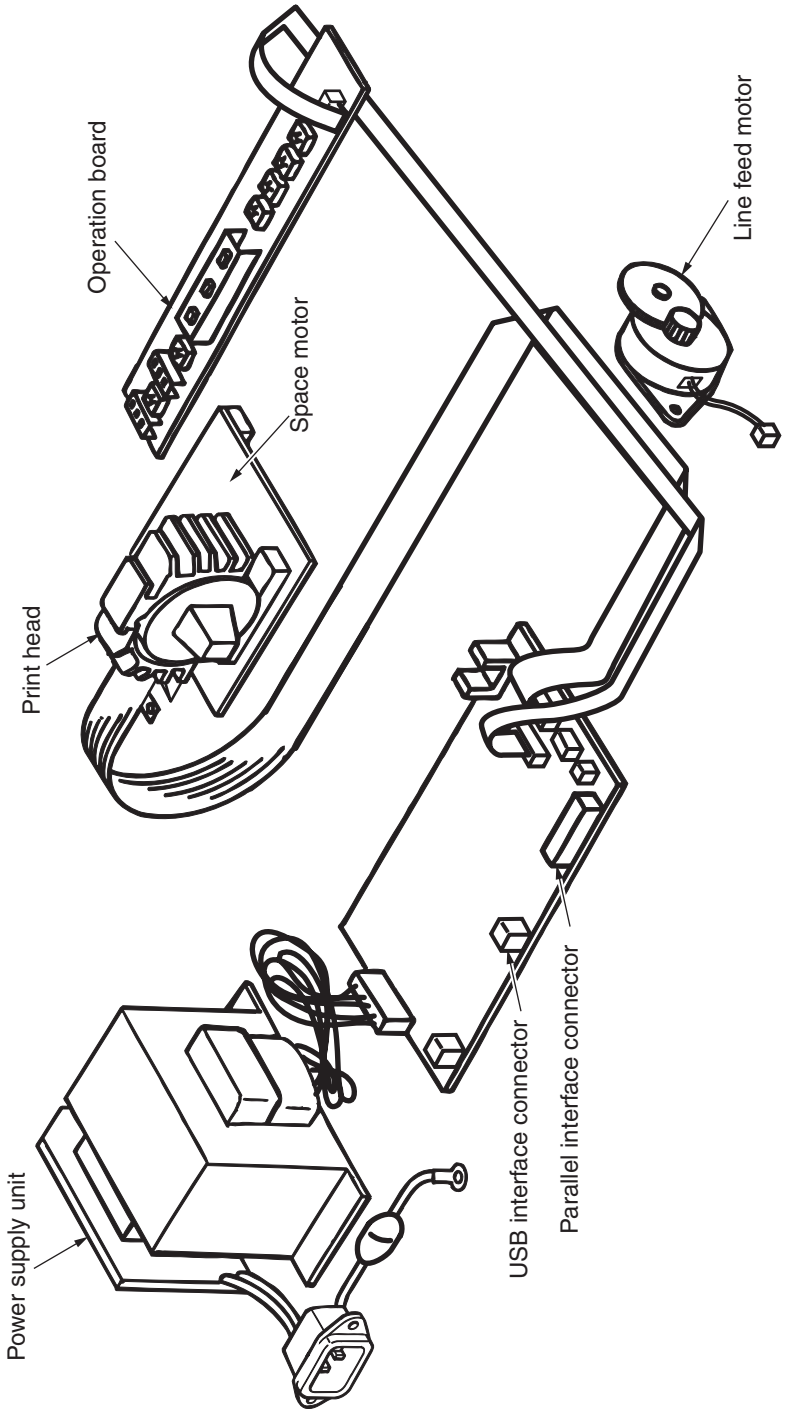


Figure1. Configuration of Electrical Section

2.1.2 Microprocessor and Its Peripheral Circuits

(1) Microprocessor (Q1: 67X640)

The microprocessor is the nucleus of the control circuit, and its peripheral circuits operate under control of this microprocessor.

The I/O ports of the microprocessor are connected with the address bus, data bus, and control lines.

The microprocessor stores the control program for the printer. The microprocessor operates under control of this program.

(2) RAM (Q5)

The RAM stores data such as received print data.

(3) EEPROM (Q10)

The EEPROM stores menu data of the printer and is controlled by the CPU of Q1.

(4) LSI (Q3:MSM0110-125)

The MSM0110-125 is an external interface and motor control LSI. It has the following functions:

(a) Parallel interface function

The parallel interface function receives interface data from IFD1 to 8 and data through the strobe signal, and outputs the parallel interface control signals of BUSY, ACK, PE, SELECT and FAULT.

(b) Space speed control function (SP motor control)

This function accelerates and decelerates the space motor in accordance with commands from the microprocessor and controls the space motor speed in each printing mode.

(c) Dot timing generation function

This function generates the dot-on timing signal ($\overline{\text{IPT}}$), synchronized with the printing speed in accordance with output signals (PHASE A, B) of the encoder on the space motor, and sends this timing information to the microprocessor. Also this function sends HEAD1 to 9 signals to the head driver and controls printing operation.

(d) I/O ports

The MSM0110-125 has some output ports and some input ports. It outputs control signals in accordance with the commands input from the microprocessor.

The MSM0110-125 reads necessary information, such as a signal of the paper end sensor, through the input port.

(e) Address latch

The address latch latches the low-order 8 bits of the address. (A0 to A7). These bits are used as an address for read/write operations with peripheral devices.

(f) Line feed motor control

The MSM0110-125 outputs signals of LF PHA, LF PHB, LFD-A-A and LFD-A-B to the LF driver and controls the LF motor.

(g) Operation board control

The MSM0110-125 controls ON/OFF of the LED on the operation board and reads switches through OPCLR-N, OPRXD, OPCLK and OPTXD signals.

(5) USB controller (Q32:ML60851)

The USB controller is a dedicated LSI for controlling USB I/F.

2.1.3 Initialization

The printer is initialized when the power is turned on or when the parallel interface signal I-PRIME is received from the host computer.

Initialization is started by resetting Q1 (microprocessor) and Q3 (interface LSI).

A program then starts and sets microprocessor (Q1) and LSI (Q3) modes, checks memory (ROM and RAM), initializes the RAM, and moves the carriage to home. Next, the program establishes the interface signals (output ACK and BUSY signals), turns on the SELECT indicator, and informs the host computer that printer is ready to receive data, thus completing the initialization.

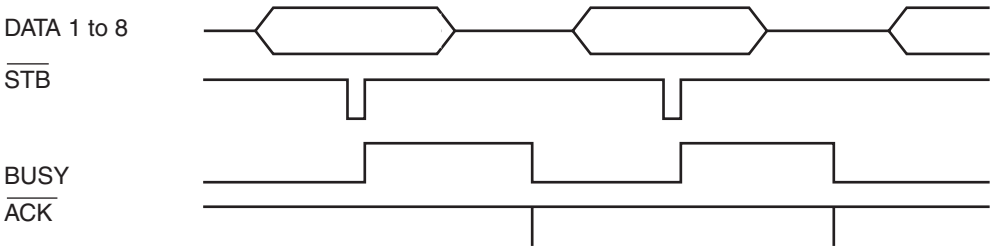
2.1.4 Interface Control

(1) Parallel interface

The data from the interface is input through the connector (CN1), and the interface LSI (Q3:MSM0110-125) latches this input data in synchronization with the $\overline{\text{STB}}$ signal.

The BUSY signal is on while processing this data. After processing, the BUSY signal is turned off and an $\overline{\text{ACK}}$ signal is sent to request the next data.

The BUSY signal is also sent to stop data sending when the receive buffer is full.



(2) USB interface

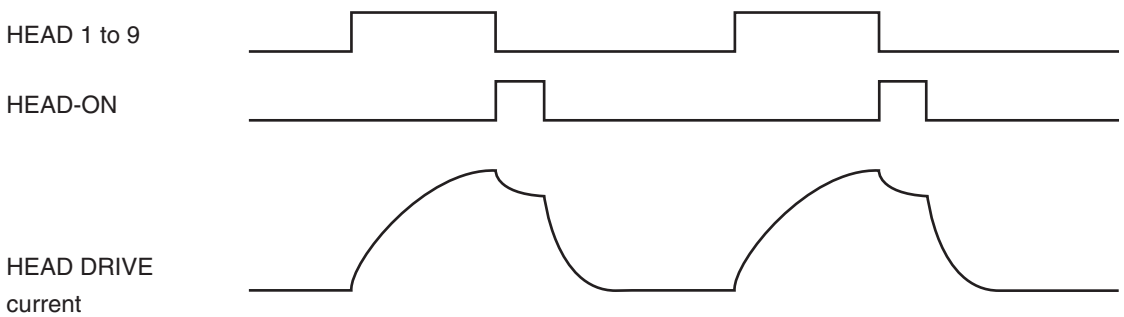
The data from the interface is input through the connector (CN6), and the interface LSI (Q32:ML60851) latches this input data.

Universal Serial Bus Specification Revision 1.1 compliance. Data signaling rate is 12 Mbps in full speed function.

2.1.5 Print Head Drive Circuit

This circuit drives the head magnets corresponding to the HEAD DATA 1 to 9 signals in synchronization with the HEAD-ON signal, thus making the print head print characters.

Head1 to 9 and HEAD-ON signals are sent form the LSI Q3.



2.1.6 Spacing Drive Circuit

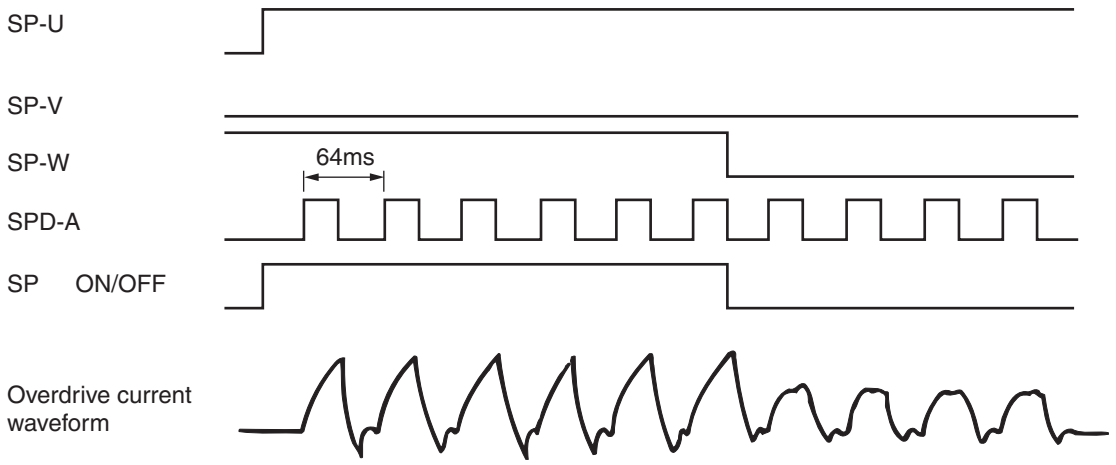
(1) Space motor control

The motor control LSI (Q3:MSM0110-125) outputs the space motor phase signals (SPU, SPV, and SPW) in accordance with the spacing command from the microprocessor, At the same time, it outputs the overdrive signal (SPD-A).

The SPD-A signal is a fixed-period pulse signal whose pulse width is controllable by program. It is used to control the motor drive time.

The SP ON/OFF signal is output during acceleration and deceleration, which requires a large amount of torques.

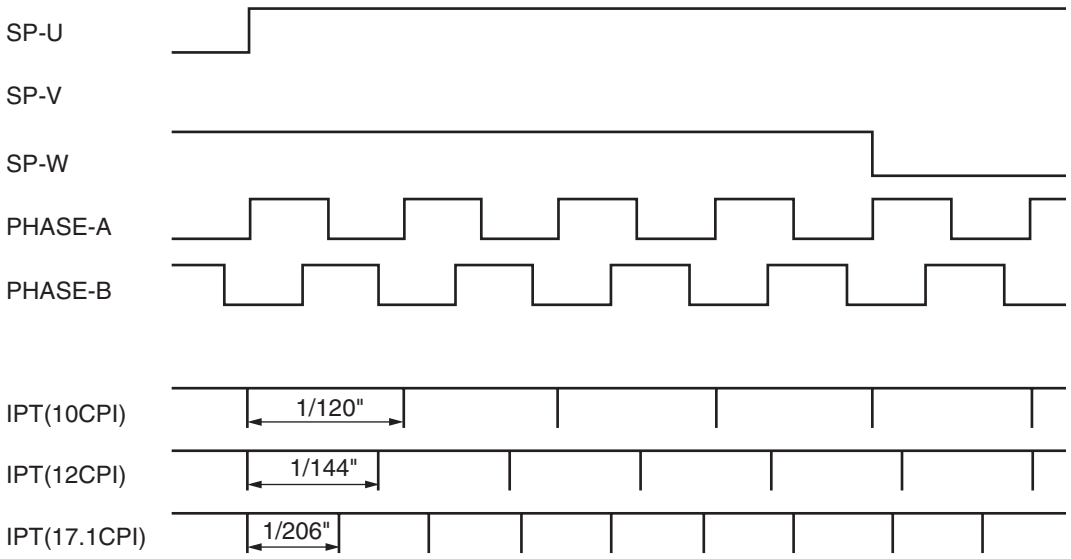
The motor driver (MTDV) drives the space motor in accordance with these signals. Pins 19 of the MTDV are for the overcurrent protective circuit.



(2) Slit encoder

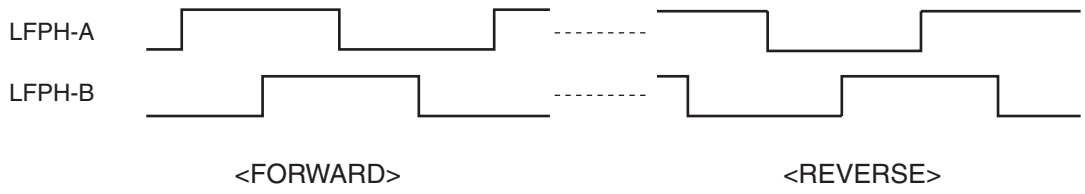
PHASE-A and PHASE-B signals are generated by the photosensor and circular slit when the space motor rotates.

The motor control LSI (Q3:MSM0110-125) frequency divides these edge pulse signals in accordance with the print pitch and outputs the IPT signal to provide dot-on timing and carriage position detection timing.



2.1.7 Line Feed Circuit

The LSI Q3 sends LFPH-A and LFPH-B signals to the LF driver (LFDV). Upon receiving these signals, the LF driver (LFDV) rotates the motor by bipolar constant current drive.



2.1.8 Alarm Circuits

(1) Drive circuit error alarm

This circuit protects the print head drive circuit, space motor drive circuit and peripheral circuits by blowing a fuse when an error occurs.

The circuit monitors the drive time using the HDALM1, SPALM, and interlocked with the overdrive signal of each drive circuit, If the drive time of any drive circuit exceeds the specified time, the drive circuit fault alarm circuit outputs an ALM signal (high) to turn on the SCR.

This short-circuits the secondary coil (40 V) of the transformer, resulting in an overcurrent in the primary coil, and blows the AC fuse.

(2) Head overheat alarm circuit

In order to protect the head coils, this circuit monitors the head temperature using the thermistor built into the print head.

If printing is performed continuously for an extended period, the print head gets hot. When the head temperature reaches a certain value (approximately 100 degrees C), a head overheat alarm is detected.

When this alarm is detected, printing stops temporarily to wait for the head to cool. When the head temperature drops below the alarm detection temperature, printing resumes.

Alarm detection is performed as follows:

The resistance of the thermistor decreases as the temperature in the print head rises, so the signal voltage level of HTEMP-N drops. Monitoring by the CPU Q1 detects the head overheat alarm.

2.1.9 Paper End Detection Circuit

When the paper runs out, The photosensor (PE) on the control board turns off, and as a result, the PAPER END signal goes to 0. This signal is fed to the LSI (Q3), stopping the printing operation and lighting the ALARM indicator.

2.1.10 Power Supply Circuit

After the output power of the transformer is commuted and smoothed via the AC transformer, each of +40VDC, +8VDC and +5VDC power is output.

AC10V is output from the AC transformer directly.

2.2 Mechanical Operation

2.2.1 The Printhead Mechanism and Its Operation (see figure 3)

The print head is spring-loaded, utilizing a permanent magnet, and can be easily removed or installed. The print head is mounted on a carriage that runs parallel to the platen and is connected with the control circuit via the head board.

The print head consists of:

(a) Wire guide
(b) Print wires
(c) Armature assembly
(d) Yoke
(e) Springs
(f) Spacer
(g) Magnet assembly
(h) Thermistor
(i) Printed-circuit board

(1) Print head operation

When the print head is in the non-printing state, each armature is attracted by the permanent magnet, and the springs holding the armatures are compressed by the thickness of the spacer, The print wires, which are fastened to the individual armatures, are therefore held retracted within the wire guide.

When signals corresponding to a character to be printed are detected by the control circuit, currents flow through the corresponding coils to nullify the magnetic flux generated by the permanent magnet between the armatures corresponding to those coils and the permanent magnet pole. As a result, those armatures are driven toward the platen by the force of the armature springs, and the print wires fastened to those armatures eject from the tip of the wire guide and strike the paper through the ribbon to print dots on the paper.

After the character is printed, the magnetic flux of the permanent magnet attracts the armatures again so that the print wires retract into the wire guide.

The print head has a built-in thermistor to prevent the coils from overheating and burning due to continuous bi-directional printing over a long period. If the coil temperature exceeds the limit (approximately 100 degrees C), the control circuit detects the thermistor signal and stops the printing operation until the coil temperature drops below the limit.

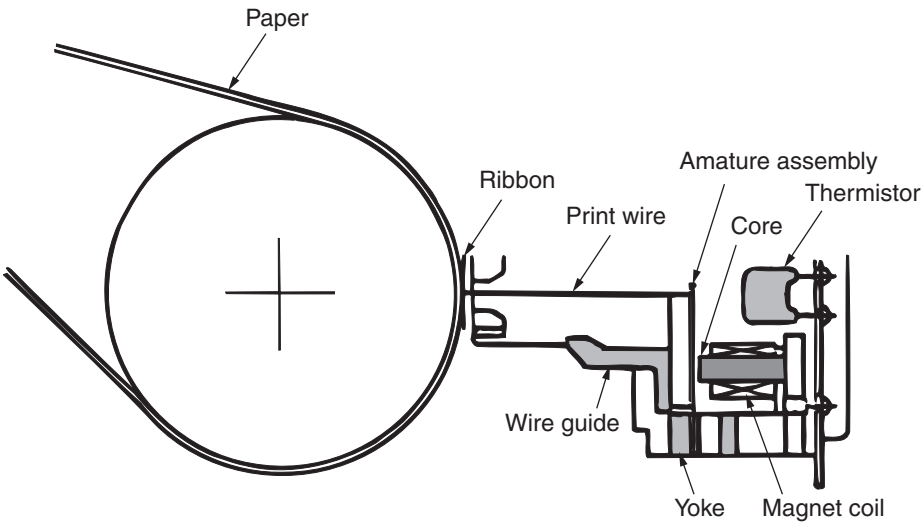


Figure 3

2.2.2 Spacing Mechanism and Operation (see figure 4)

The spacing operation is performed by driving the carriage frame, which is guided by carriage shaft mounted parallel to the platen, with the DC motor mounted on the bottom of the carriage frame.

The space mechanism consists of:

(a) DC motor with motor gear
(b) Carriage frame (including stator yoke and motor board)
(c) Carriage shaft
(d) Space rack
(e) Slit sensor
(f) Slit disk

(1) Spacing operation

The carriage, with the print head and space motor mounted on it, moves parallel to the platen along the carriage shaft. As the space motor rotates counterclockwise, the motor gear is driven rightward along the space rack, and as a result, the carriage is also driven rightward.

The spacing mechanism is so designed that the carriage frame moves 0.8 inch (20.56 mm) when the space motor rotates once.

The motor also rotates the slit disk, and the slit passes through the slit sensor. The position of the carriage frame can be obtained by counting the number of slits detected by the slit sensor.

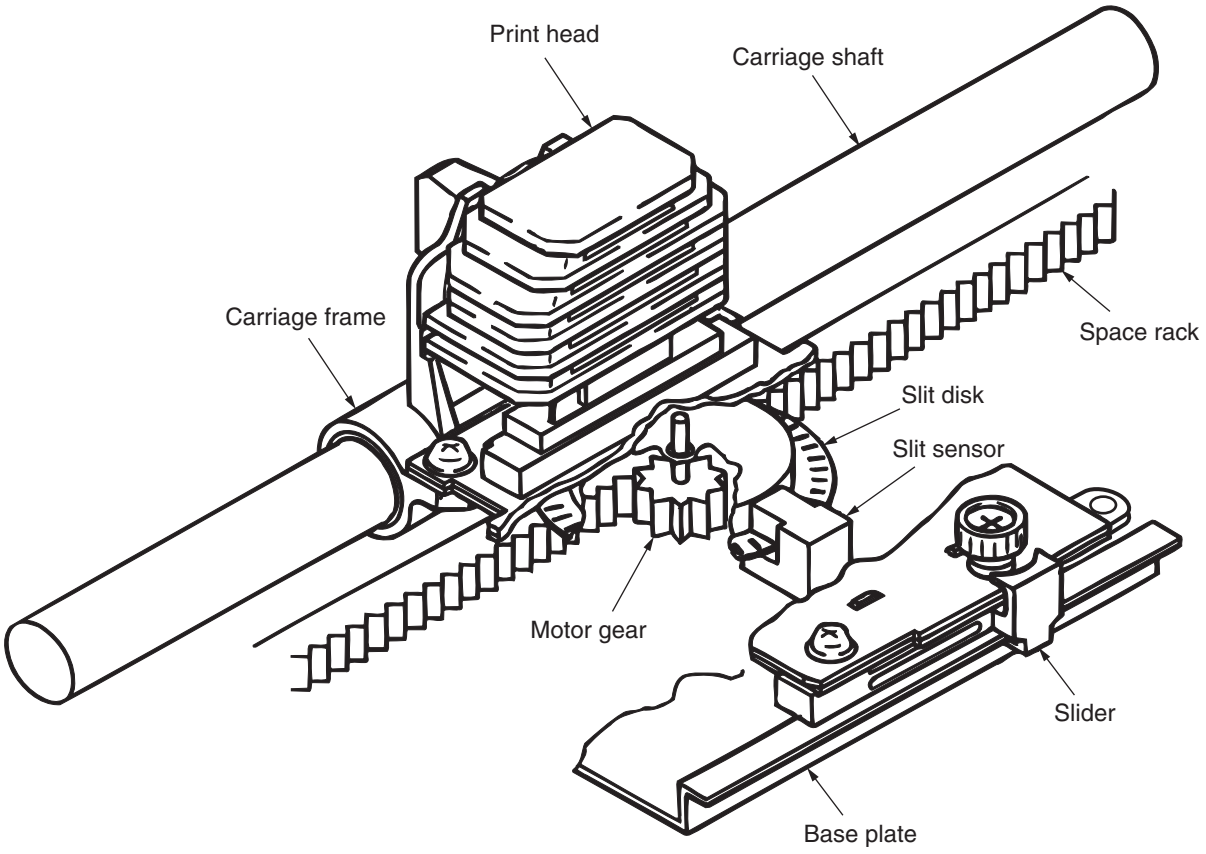


Figure 4

2.2.3 Head-Gap Adjusting Mechanism (see figure 5)

The head-gap adjusting mechanism adjusts the gap between the platen and print head by changing the tilt angle of the carriage frame with the adjusting lever.

When the adjusting lever is operated, the adjusting screw, which is interlocked with the lever via a gear, rotates to change the tilt angle of the carriage frame around the carriage shaft.

The print head, mounted vertically opposite the adjusting screw on the carriage frame, moves toward or away from the platen with change in the carriage frame tilt angle.

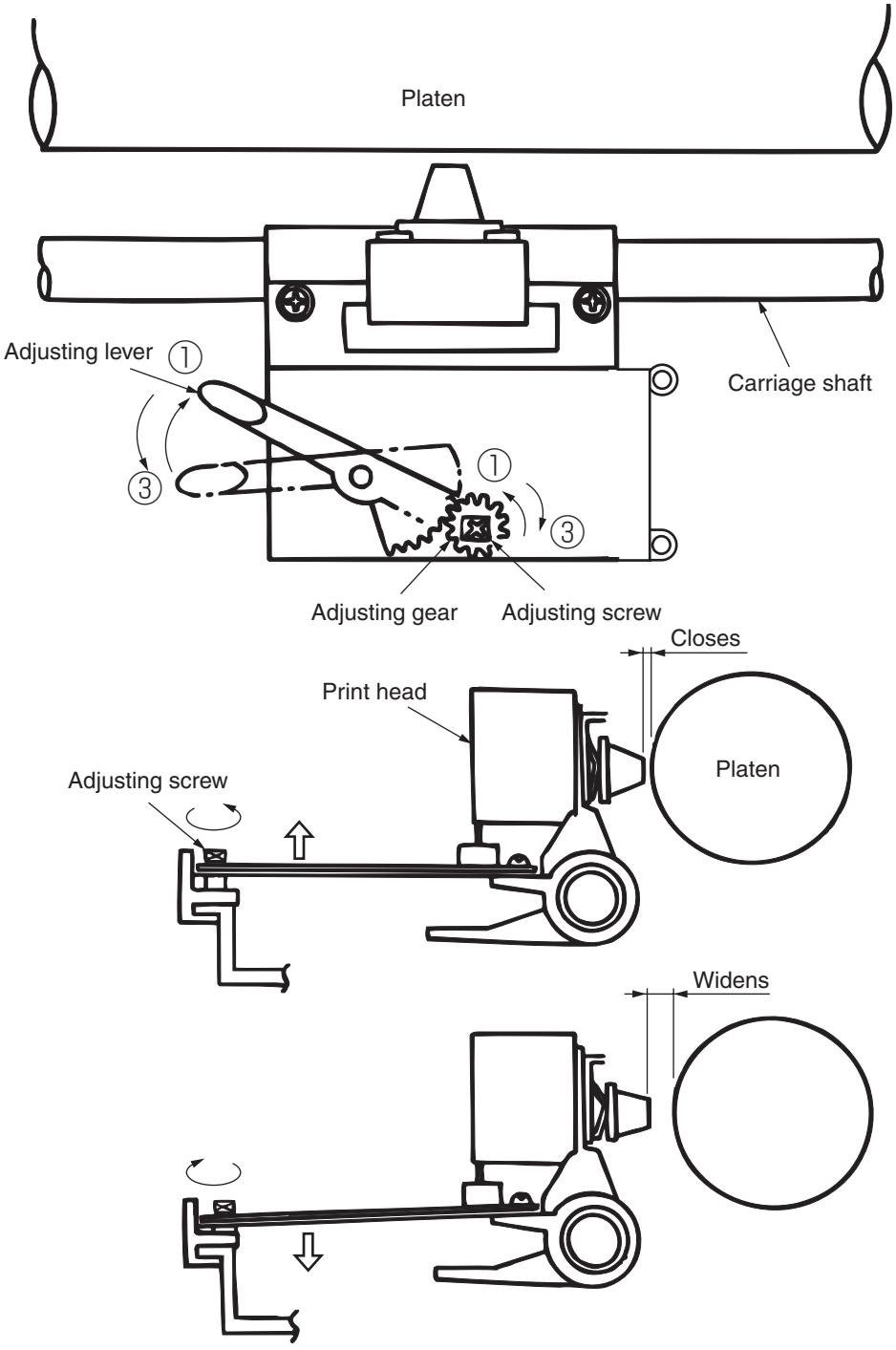


Figure 5

2.2.4 Ribbon Feed Mechanism and Operation (see figure 6)

The ribbon feed mechanism feeds the ribbon in synchronization with the spacing operation. The mechanism is driven by the space motor.

The ribbon feed mechanism consists of:

(a) Ribbon feed gear assembly
(b) Ribbon gear (space motor)
(c) Ribbon cartridge

(1) Ribbon cartridge

A one-way-feed endless ribbon is used. Ink is replenished by the built-in ink tank in the ribbon cartridge so that clear printing is always assured.

(2) Ribbon feed operation

As the space motor rotates, the ribbon gear on the space motor shaft rotates to drive the drive gear in the ribbon cartridge via the ribbon feed gear assembly, thus feeding the ribbon.

In bi-directional printing, the ribbon gear rotational direction reverses every time the carriage movement reverses. In this case, the gears in the ribbon feed gear assembly switch the rotational direction so as to feed the ribbon in a fixed direction.

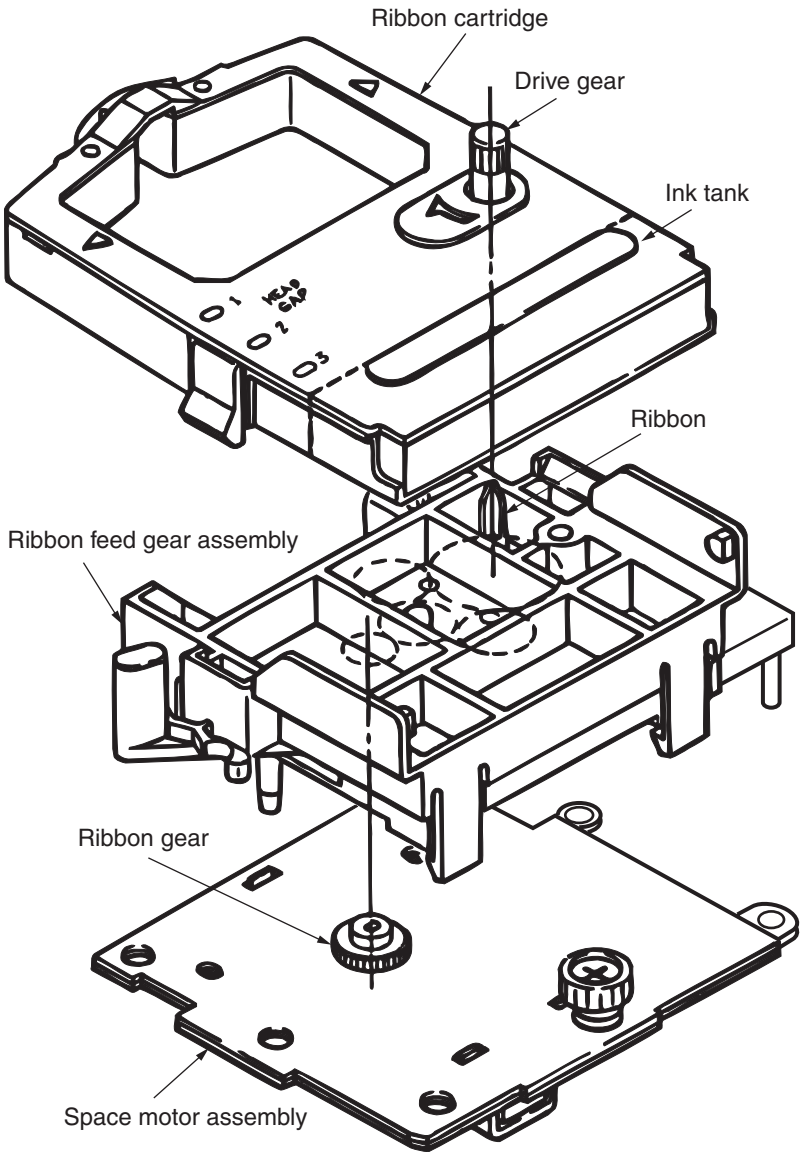


Figure 6

2.2.5 Paper Feed Mechanism and Operation

Paper feed is performed by rotating the platen and pin tractors, which are driven by the LF pulse motor.

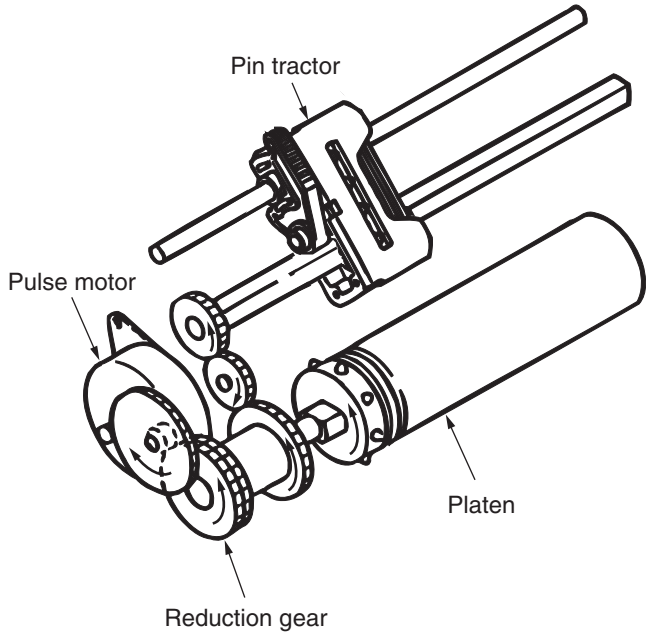
The paper feed mechanism consists of:

(a) Pulse motor with gear
(b) Reduction gear
(c) Platen
(d) Tractor feed unit
(e) Pressure roller

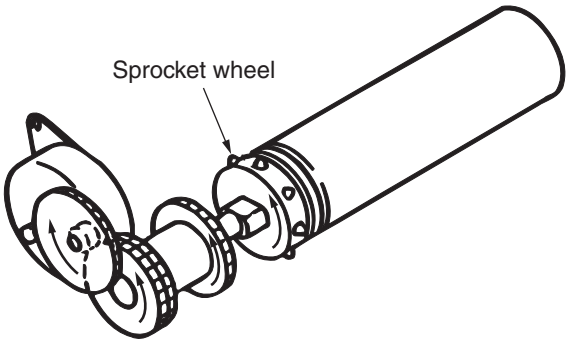
(1) Paper feed operation (see figure 7)

The paper feed pulse motor is mounted on the left side frame. Its rotation is transmitted to the platen through the reduction gear. Platen rotation is also transmitted through the idle gear to the tractor feed unit.

The paper feed mechanism is so designed that when the pulse motor rotates 48 steps (360 degrees), paper is fed 0.17 inch (4.32 mm).



Tractor feed (option)



Fixed pin feed

Figure 7

(2) Paper clamp mechanism (see figure 8)

When the release lever is set to open, the release link moves backward, and the front and rear release links rotate counterclockwise. At the same time, the interlocked release shaft also rotates counterclockwise sot that a gap is made between the pressure rollers and platen, allowing insertion of paper.

When the release lever is set to close, the release link moves forward, and the front and rear release links rotate clockwise, At the same time, the interlocked release shaft also rotates clockwise so that the pressure rollers are pushed against the platen by the front and rear pressure levers, allowing paper to be fed.

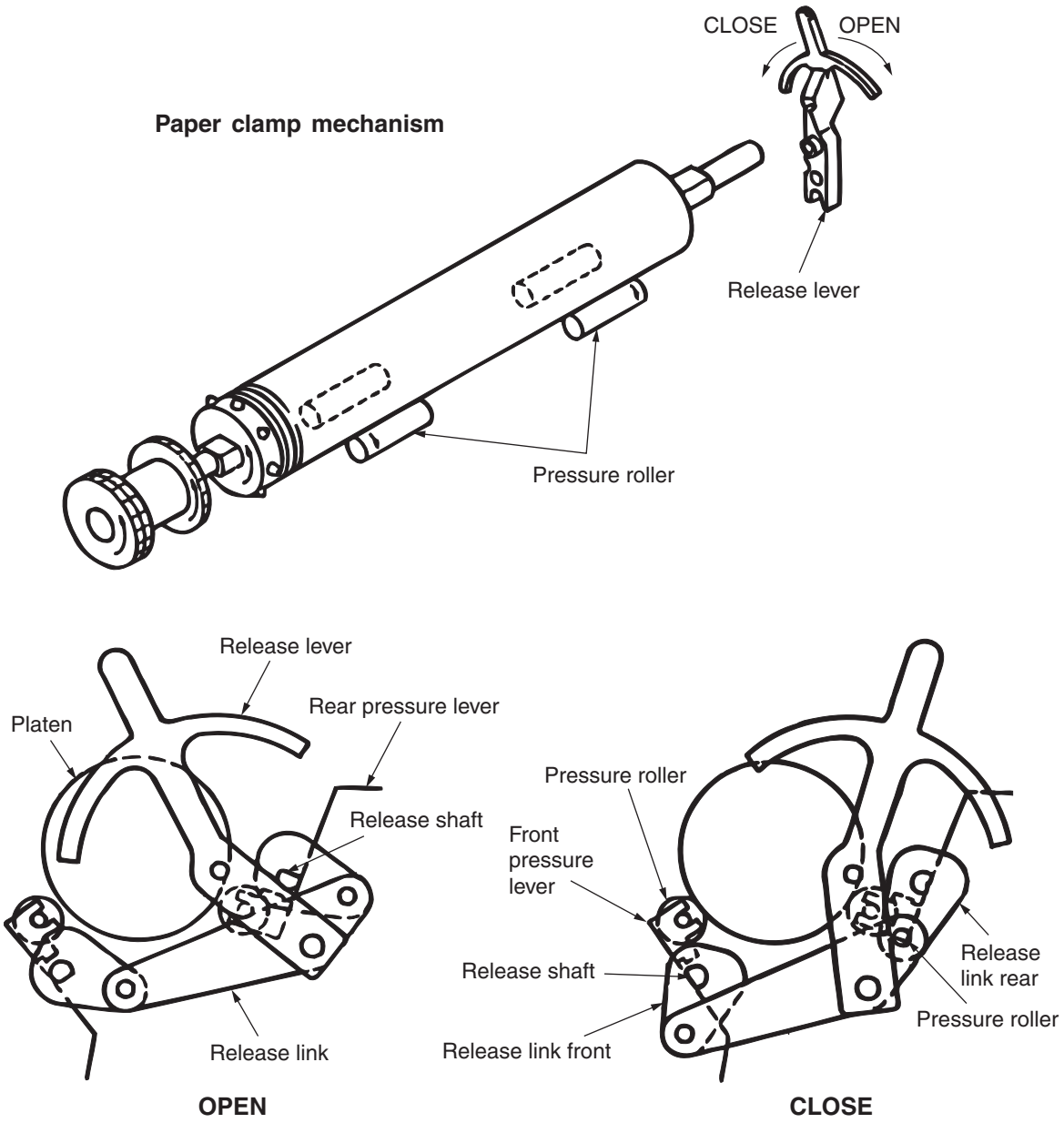


Figure 8

2.2.6 Paper -End Detection Mechanism (see figure 9)

(1) Rear paper feed

When paper is present in the printer, the paper prevents the near-end lever from falling into the groove of the paper-chute, and the paper-end sensor is on.

When the printer runs out of paper, the near-end lever falls into the groove of the paper-chute so that the rear part of the near- end lever turns off the paper-end sensor, and thus paper-end is detected. Paper-end is detected when the end of the remaining paper is approximately 1 inch (25.4 mm) from the printing position.

(2) Bottom paper feed

When paper is present in the printer, the paper prevents the bottom near-end lever from falling into the hole in the bottom paper guide. That is, the wedge on the bottom near-end lever pushes down the projection of the near-end lever, and the paper-end sensor is on.

When the printer runs out of paper, the tip of the bottom near-end lever falls into the hole in the bottom paper guide so that the rear part of the near-end lever turns off the paper-end sensor, and thus paper-end is detected. Paper-end is detected when the end of the remaining paper is approximately 1 inch (25.4 mm) from the printing position.

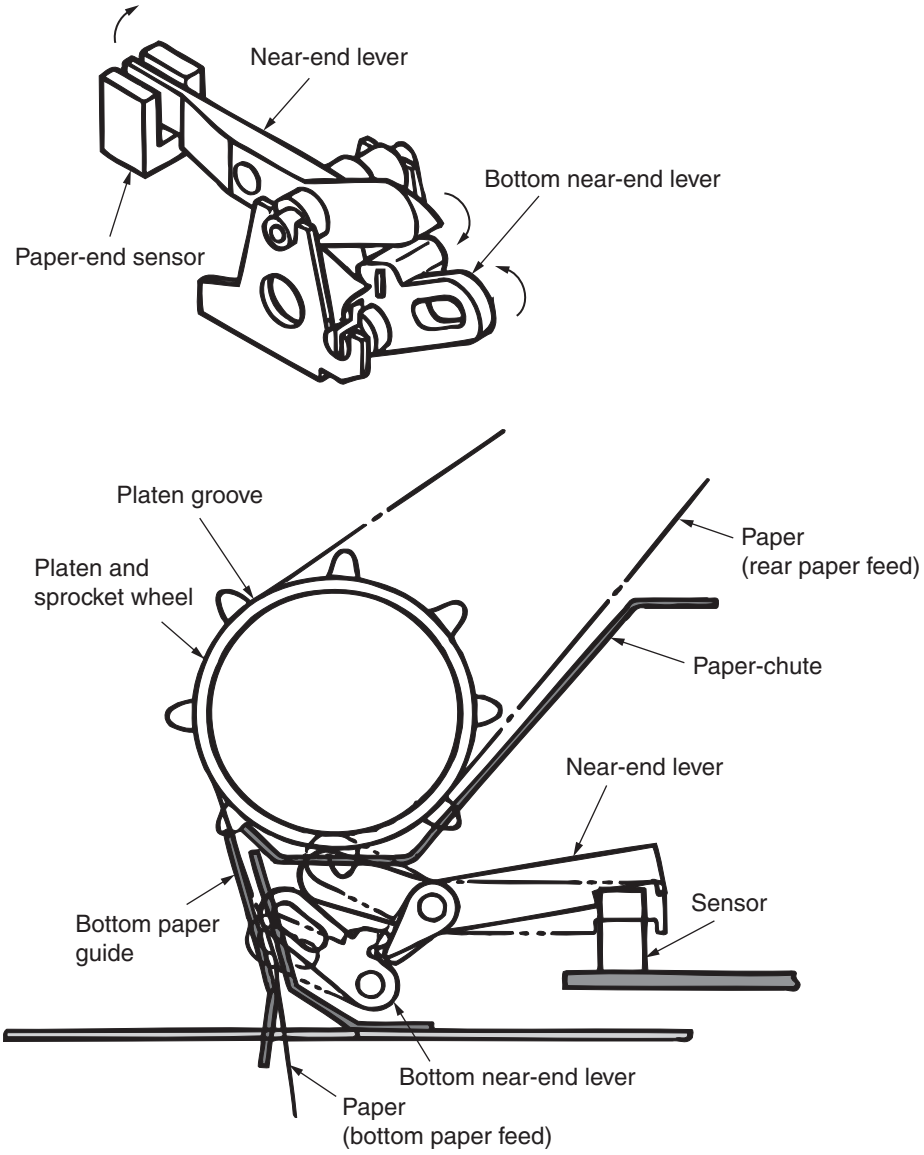


Figure 9

3. ASSEMBLY/DISASSEMBLY

3.1 Precaution for parts Replacement

(1) Be sure to remove the DC cord and interface cable before disassembly or reassembly:

(a) Turn off the AC power switch, remove the AC input plug on the AC cord from the AC receptacle, then remove the AC cord from the inlet on the printer side.

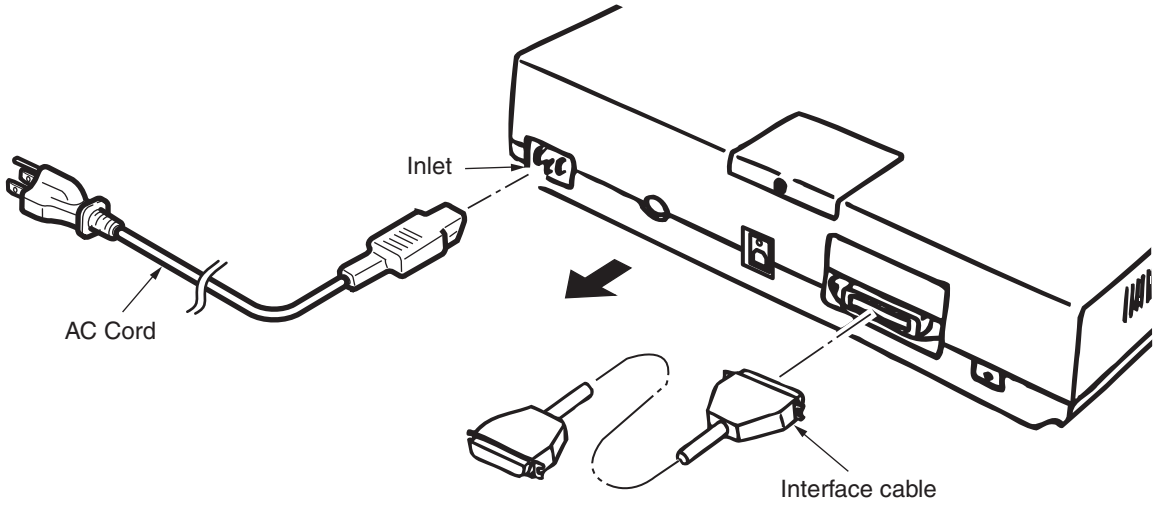
⚠Warning	Risk of electric shock	

There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cord is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

(b) To reconnect the AC cord, first connect it to the inlet on the printer side, then connect the AC input plug to the AC receptacle.



(2) Do not disassemble the printer as long as it is in good operating condition.

(3) Be careful not to remove parts unless necessary. Disassembly should be kept to minimum.

(4) Use only the specified maintenance tools.

(5) Disassemble the printer in the specified order. Otherwise, parts may be damaged.

(6) During disassembly temporarily attach small parts, such as screws and collars, in their original places so as not to lose then.

(7) ICs such as the microprocessor and RAM units are easily damaged by static electricity. Do not wear gloves that are apt to produce static electricity when handing printed-circuit boards.

(8) Do not place the printed-circuit boards directly on the printer or the floor.

3.2 Maintenance Tools

The tools in table 3-1 are necessary for replacing printed-circuit boards and parts in the field. Different tools may be necessary for other maintenance procedure.

Table 3-1 Maintenance Tools

No.	Tool	Quantity	Purpose
1	Phillips screwdriver No.1-100	1	2- to 2.6-mm screws
2	Phillips screwdriver No.2-200	1	3- to 5-mm screws
3	Screwdriver No.3-100	1	
4	Cutters No.5H	1	
5	Round Pliers No.1	1	
6	Tension gauge	1	250g
7	Metal rod	1	for head gap adjustment
8	Volt-ohm-milliammeter	1	
9	Thickness gauge set	1 1	(1) for head gap adjustment (2) for adjusting gap between space rack and roller

3.3 Disassembly/Reassembly of Procedure

This section explains the assembly replacement procedures according to the following disassembly system.

[Parts Layout]

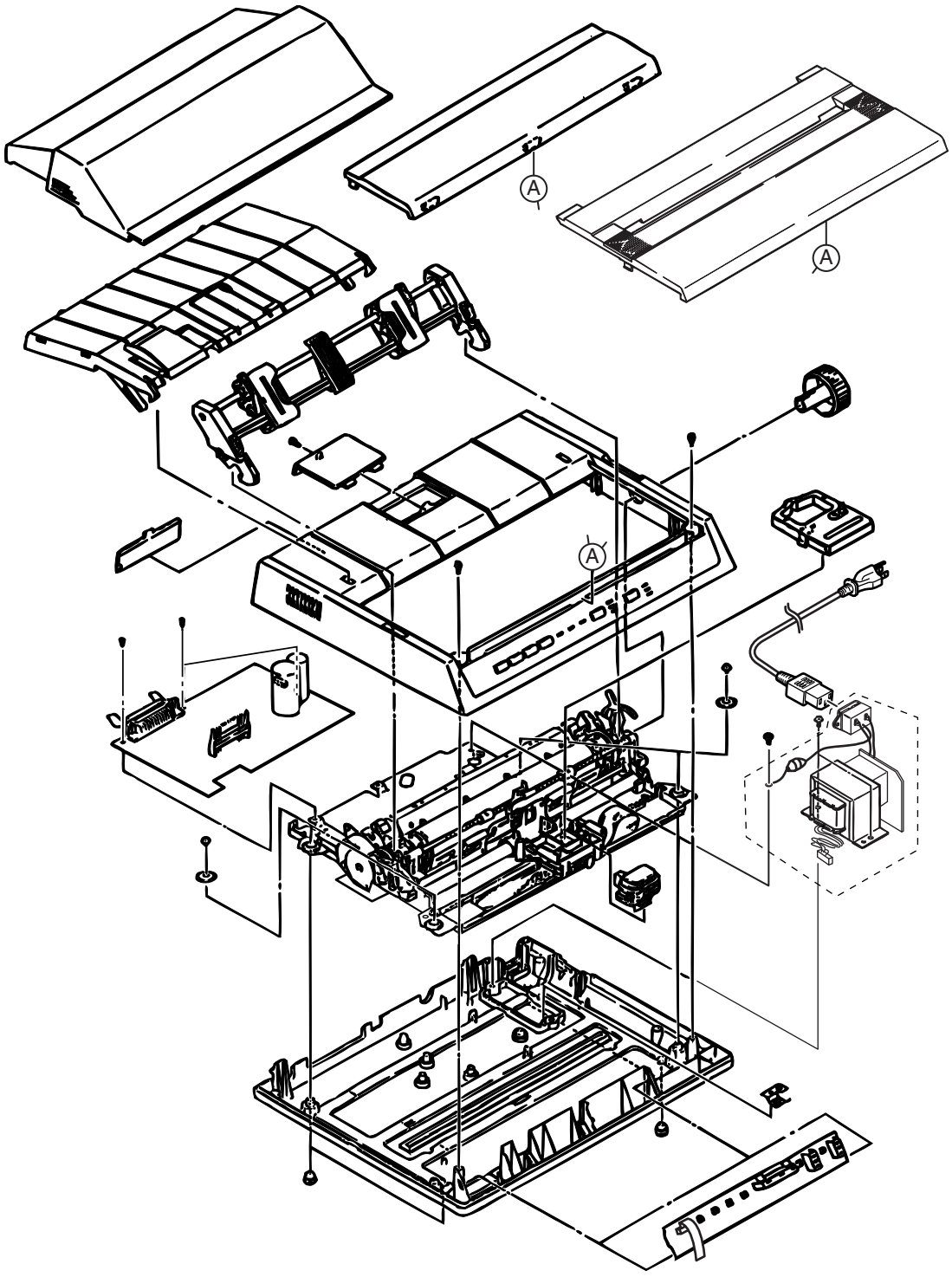
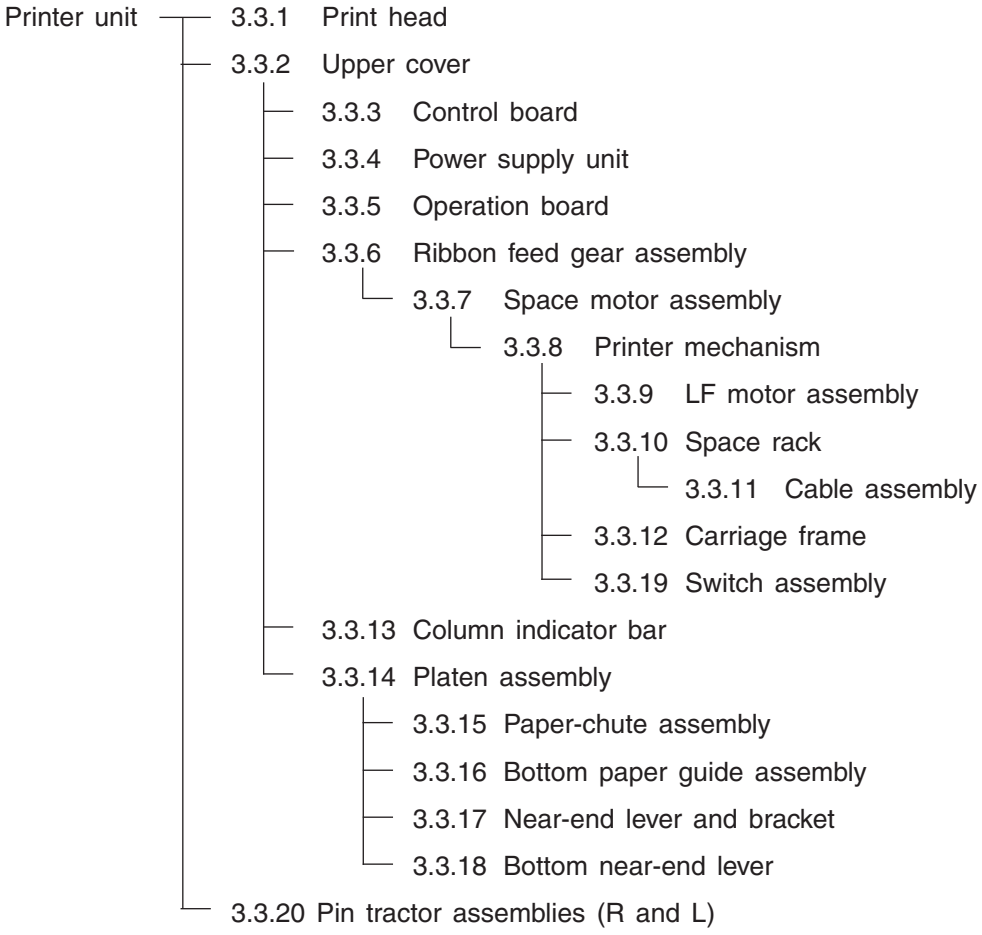


Figure 3-1

[How to Change Parts]

This section explains how toe change parts and assemblies appearing in the disassembly diagram below.



3.3.1 Print Head

(1) Turn OFF the DC POWER switch, and remove DC cable ① from the outlet.

Caution: *Print head may be hot after printing.*

(2) Remove access cover ② by lifting the rear edge of the cover.

(3) Remove ribbon cartridge ③ by firmly holding both sides Ⓐ and lifting.

(4) Raise head clamp ④ and lift print head ⑤ straight up.

(5) For reassembly, reverse the disassembly procedure.

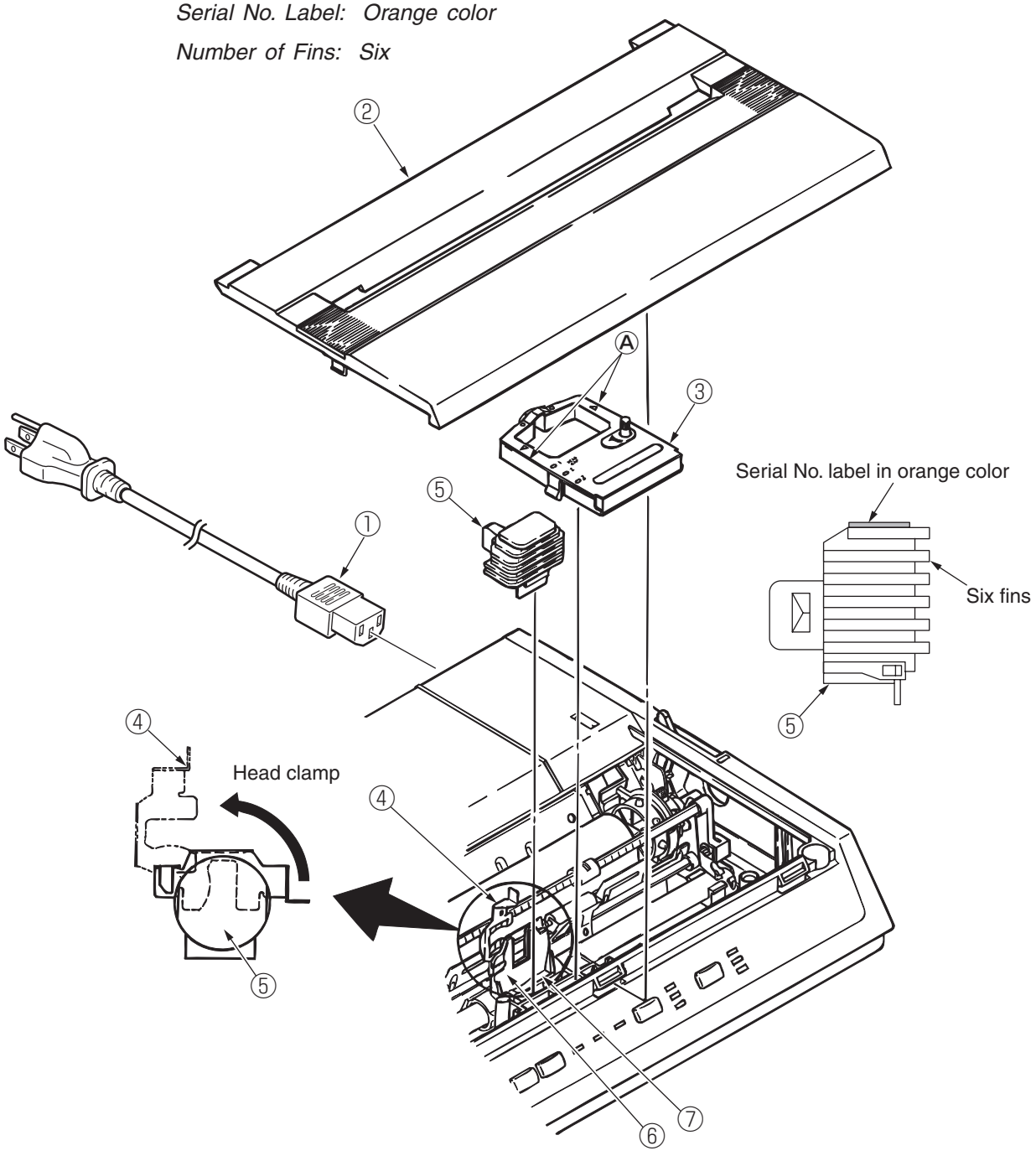
Note:

1. *Insert the print head ⑤ in connector ⑥ while pressing it against the carriage frame ⑦.*
2. *When reinstalling the print head, observe the following of the print head are correct, and reassemble parts:*

   Part Number: 42666401

   Serial No. Label: Orange color

   Number of Fins: Six



3.3.2 Upper Cover

(1) Turn OFF the DC POWER switch, remove DC cable ① from the outlet, remove interface cable ②, and remove paper.

(2) Remove the acoustic cover and paper separator (if installed).

(3) Remove the pin tractor assembly ③ by depressing the lock lever ④ and tilting it backward (if installed).

(4) Remove screw ⑤, holding the ground strap to the roll paper stand ⑥, and open the sheet guide ⑦.

(5) Remove roll paper shaft ⑧ by pulling upward, then remove roll paper stand ⑥ by tilting it forward (if roll paper stand is installed).

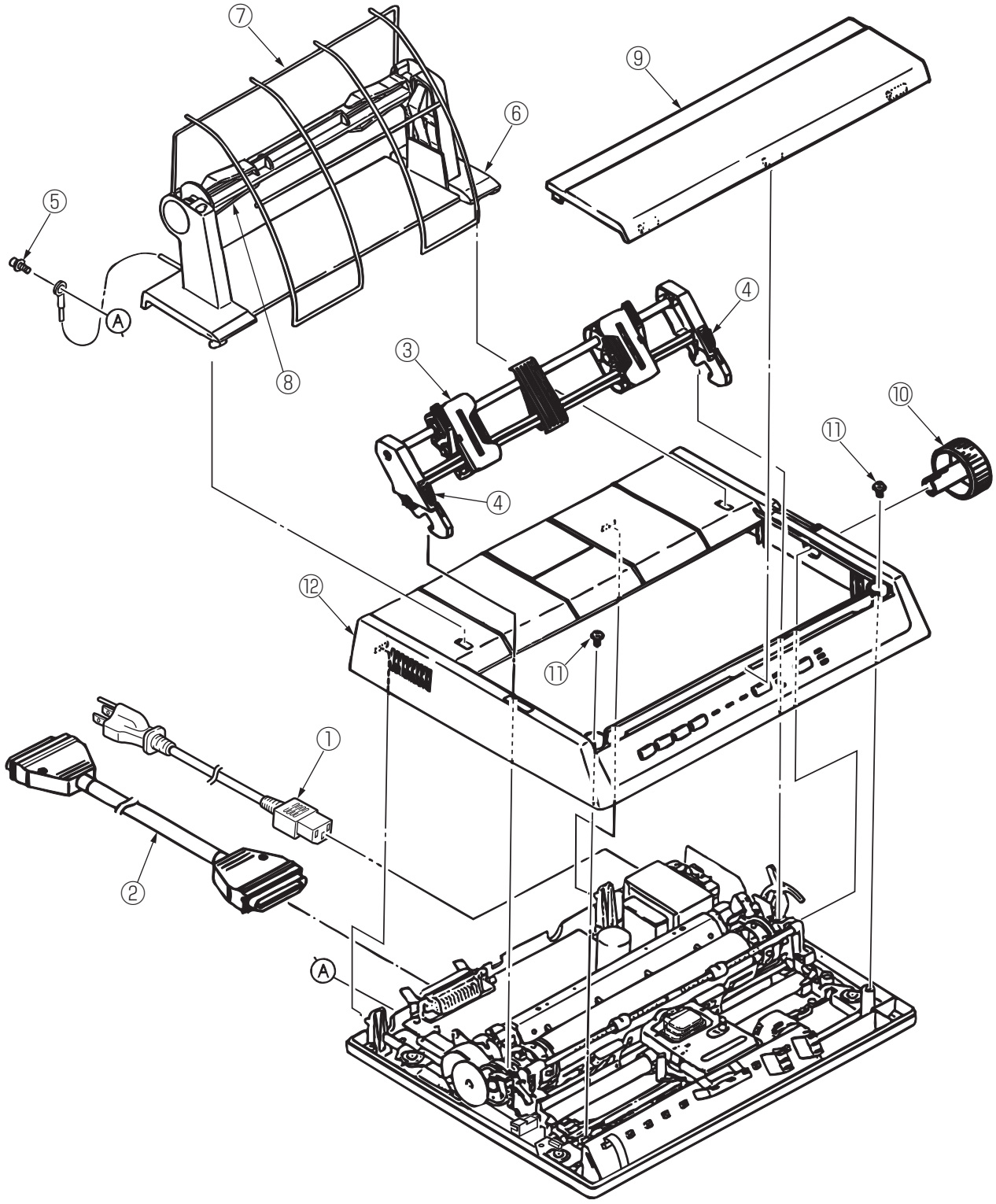
(6) Remove access cover ⑨ by lifting the rear edge.

(7) Pull out platen knob ⑩.

(8) Remove two screws ⑪.

(9) Remove upper cover ⑫ by lifting the front and pushing it backward.

(10) For reassembly, reverse the disassembly procedure.


⑦
⑨
⑥
⑤
Ⓐ
④
③
⑧
⑩
⑪
④
⑫
⑪
①
②
Ⓐ

3.3.3 Control Board

(1) Remove the upper cover (see 3.3.2).

(2) Remove the serial interface board if installed by removing the two screws located on both sides of the interface connector. Remove the interface board by lifting it (if installed).

(3) Unplug from the control board ① the power cord ②, the operation panel cable ③, the LF motor cord ④ and the bail open switch cord ⑤.

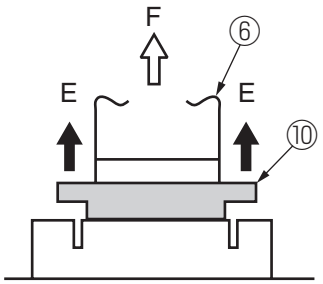
(4) Unplug the print head cable ⑥ according to figure D.

(5) Remove the three screws ⑦.

(6) Move the control board ① in the direction of the arrow B (obliquely backward) and, removing the part C fitted into the frame ⑧, detach the board.

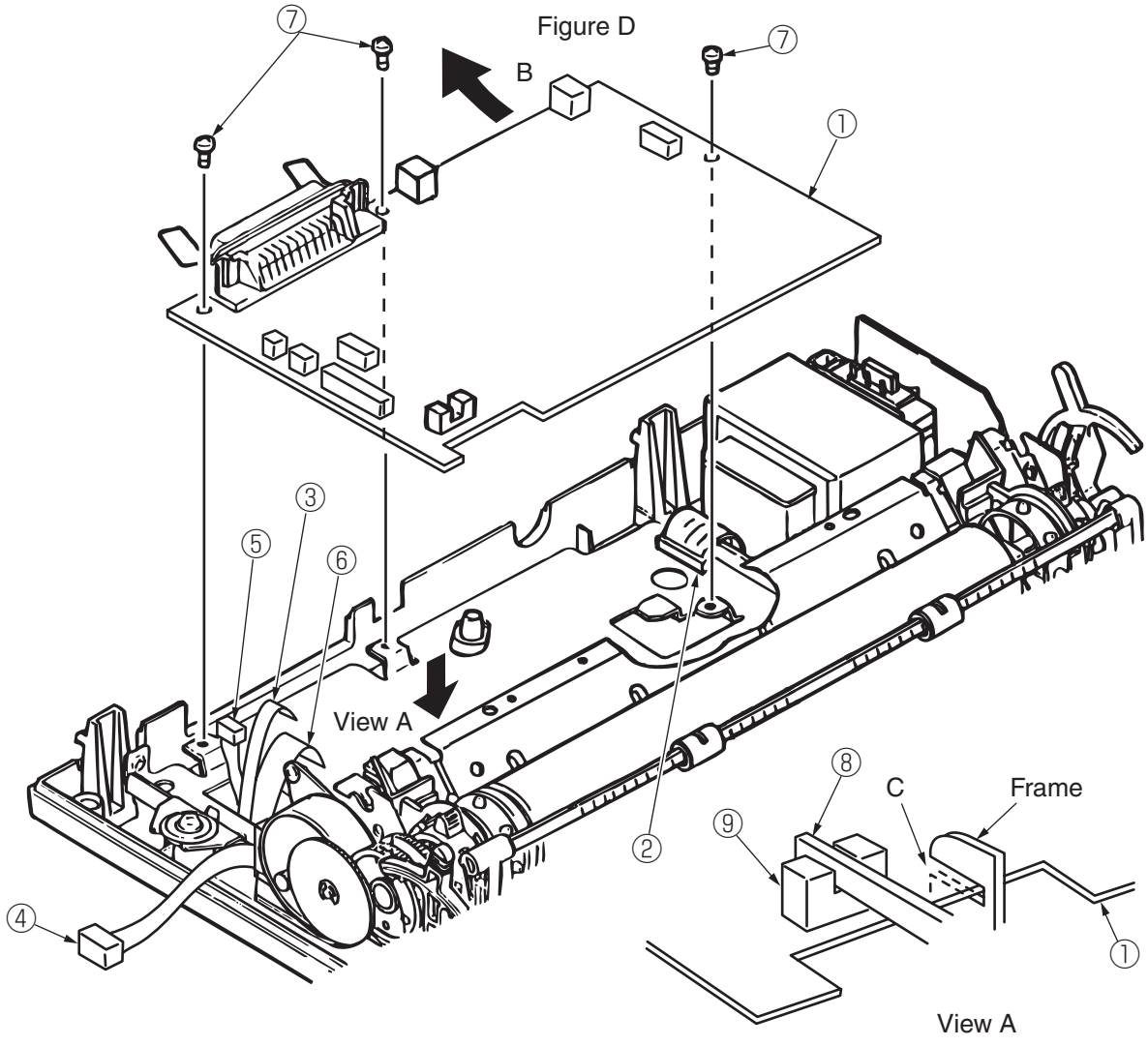
(7) For reassembly, reverse the disassembly procedure.

Notes:*When attaching, make sure that paper near-end lever ⑧ is in the photosensor grove ⑨ on the control board ①.*



Pull the both sides of the lock ⑩ in the direction E (upward) to unplug the head cable ⑥ in the direction F.

Figure D



View A

3.3.4 Power supply unit

⚠Warning	Risk of Electric Shock	

There is a risk of electric shock during replacement of the power supply.

Use insulating gloves or avoid direct contact with any conducting part of the power supply, and caution should be exercised during replacement.

The capacitor may take one minute to complete discharge after the AC cord is unplugged. Also, there is a possibility that the capacitor doesn't discharge because of a breakage of the PCB, etc., so remember the possibility of electric shock to avoid electric shock.

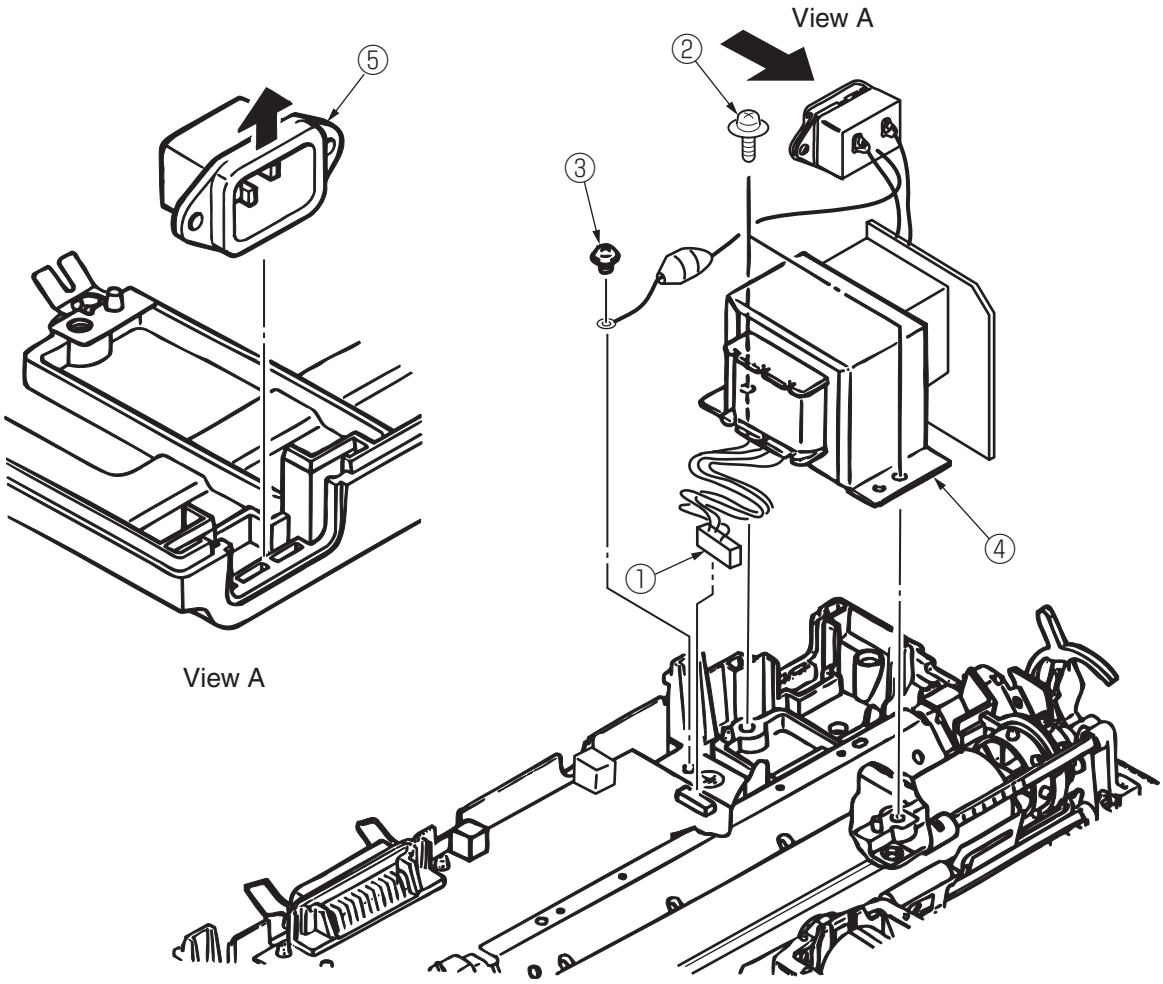
(1) Remove the upper cover (see 3.3.2).

(2) Remove power supply connector ① from the control board.

(3) Remove two screws ② and remove screw ③.

(4) Remove power supply unit ④ together with cord receptacle ⑤ by lifting.

(5) For reassembly, reverse the disassembly procedure.



3.3.5 Operation Board

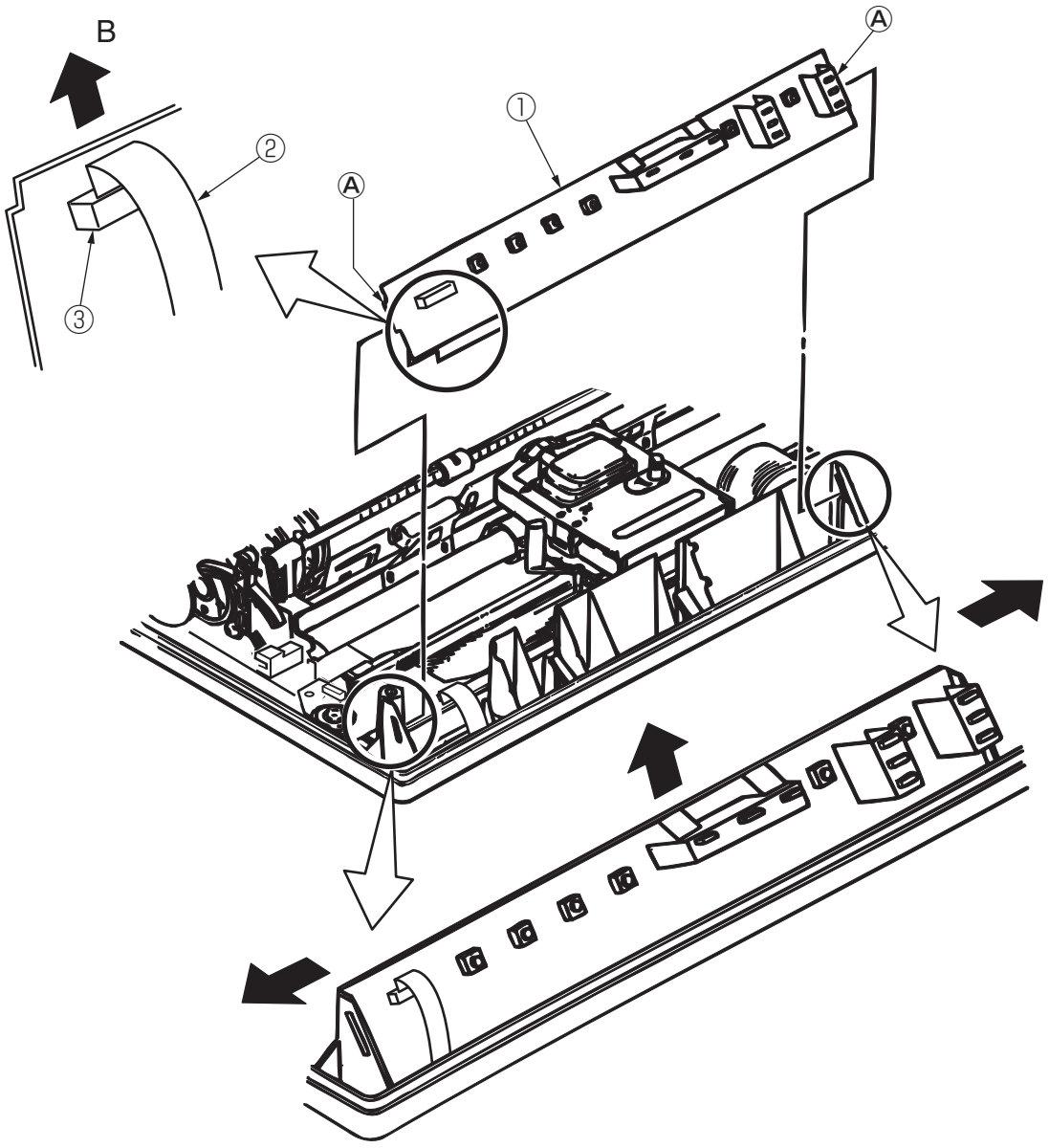
(1) Remove the upper cover (see 3.3.2).

(2) Disengage both ends Ⓐ and remove the operation panel ① by sliding upward.

(3) Unplug the operation panel cable ② from the connector ③ (in the direction of the arrow B).

(4) For reassembly, reverse the disassembly procedure.

Note: *Be careful not to damage the cable connecting the switch and the connector.*



3.3.6 Ribbon-feed Gear Assembly

(1) Remove the upper cover (see 3.3.2).

(2) Remove the print head (see 3.3.1).

(3) Disengage the two front tabs ① and two rear tabs ②. Then lift by inserting small flat screwdriver in the slot.

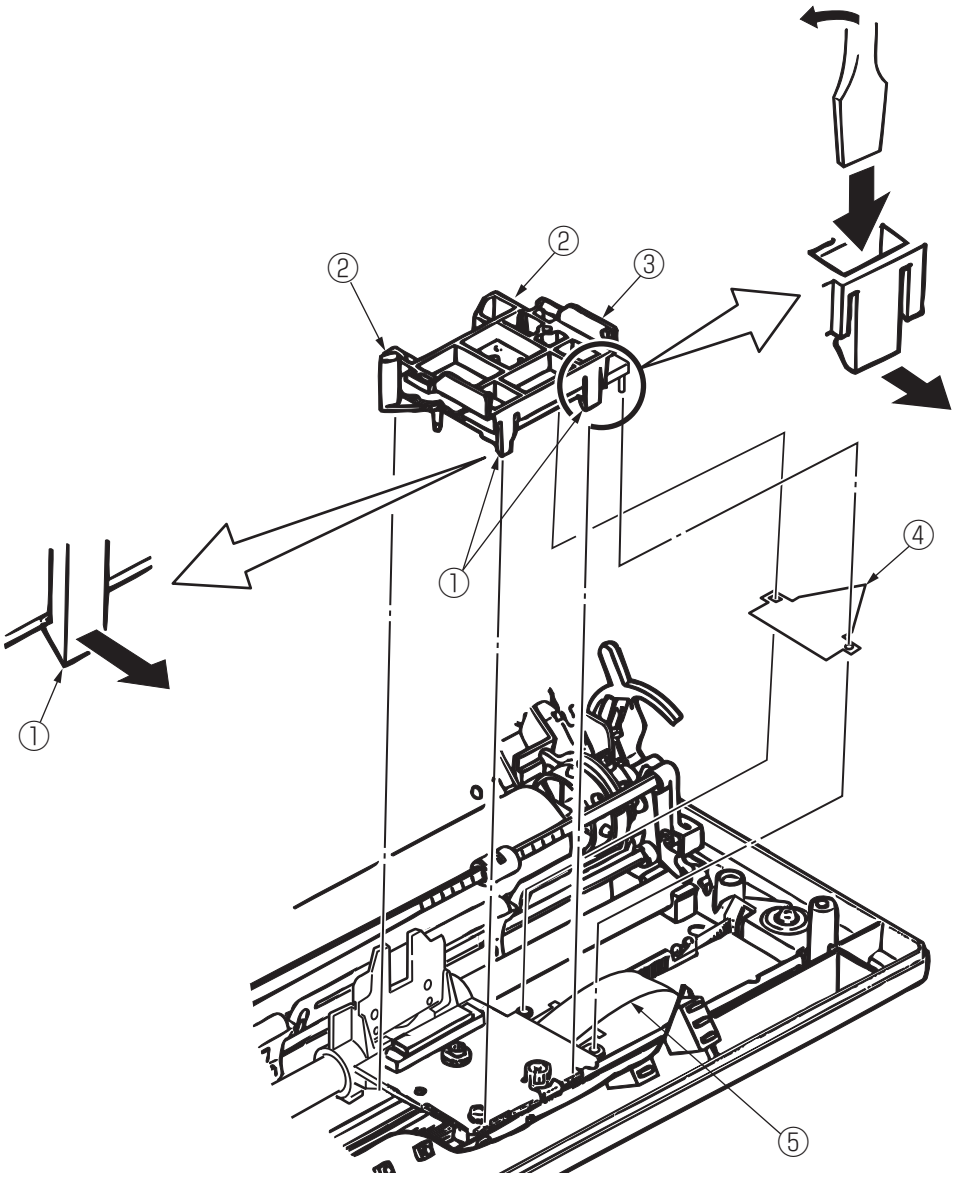
(4) Remove ribbon feed gear assembly ③.

(5) Remove cable holder ④, from ribbon feed gear assembly ③.

(6) For reassembly, reverse the disassembly procedure.

Notes:

1. *Ribbon-feed gear assembly must be replaced with space motor assembly (see 3.3.7), cable assembly (see 3.3.11) and carriage frame (see 3.3.12). Ribbon-feed gear assembly, space motor assembly, cable assembly and carriage frame are all contained in maintenance kit-space motor.*
2. *Make sure carriage cable ⑤ is not bent.*
3. *After installing ribbon feed gear assembly ③, check and adjust the gap between the platen and print head (see 4.1). Also, Check and adjust the gap between the space rack and roller.*



3.3.7 Space Motor Assembly

(1) Remove the upper cover (see 3.3.2).

(2) Remove the print head (see 3.3.1).

(3) Remove the ribbon feed gear assembly (see 3.3.6).

(4) Remove connector ① while checking the concave surface.

(5) Remove three screws ②.

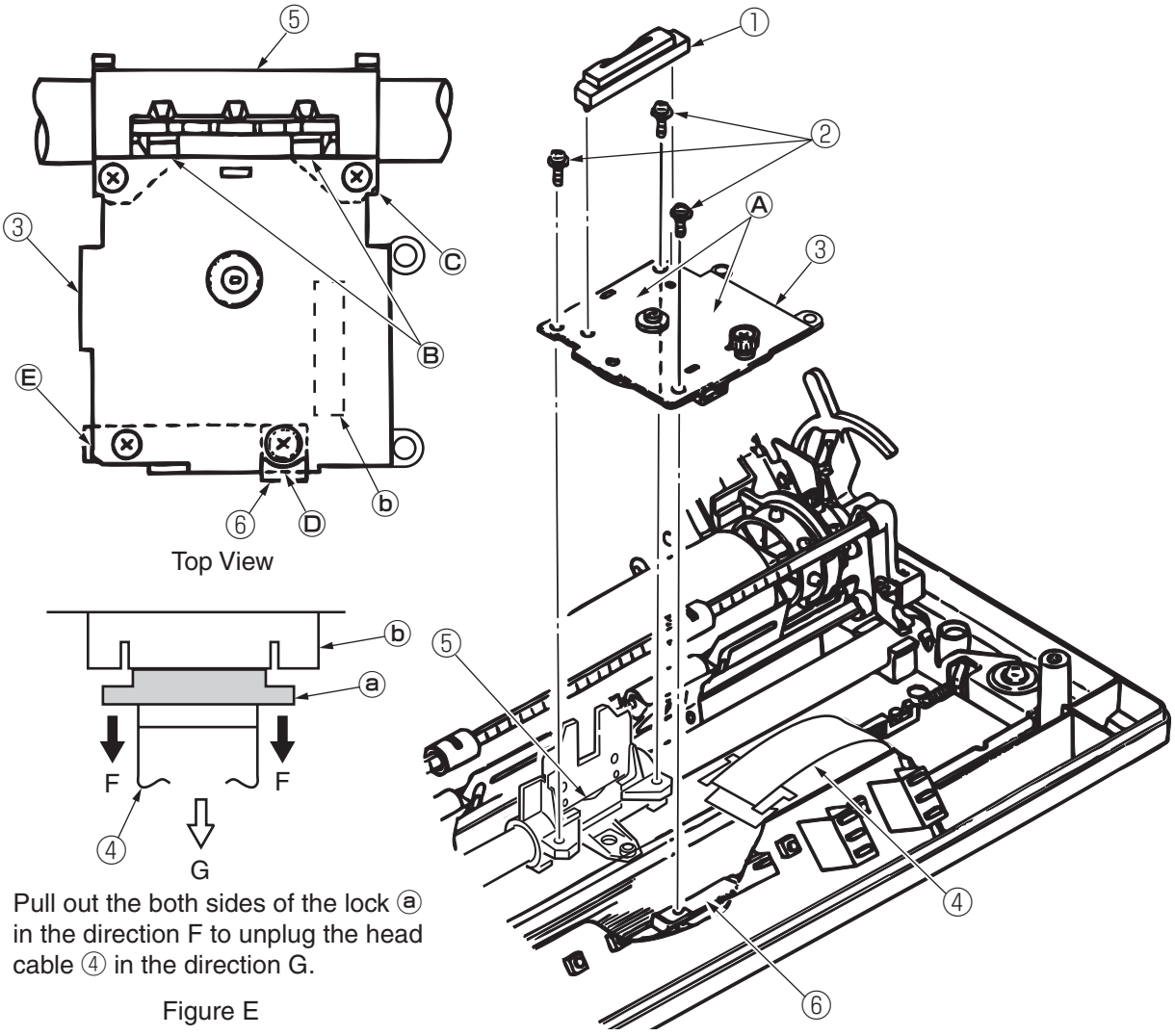
(6) Remove space motor assembly ③.

(7) Unplug the head cable ④ from the connector ⓑ according to figure E.

(8) For reassembly, reverse the disassembly procedure.

Notes:

1. *Space motor assembly must be replaced with ribbon-feed gear assembly (see 3.3.6), cable assembly (see 3.3.11) and carriage frame (see 3.3.12). Space motor assembly, ribbon-feed gear assembly, cable assembly and carriage frame are all contained in maintenance kit-space motor.*
2. *When installing space motor assembly ③, place the Ⓑ side of the assembly close to carriage frame ⑤, and align the Ⓒ side of the assembly with the corresponding side of the carriage frame. Then adjust the gap between the space rack and roller (see 4.2)*
3. *When installing slider ⑥, place the Ⓓ and Ⓔ parts of the slider close to space motor assembly ③.*
4. *After installing space motor assembly, check and adjust the gap between the platen and print head (see 4.1).*



Pull out the both sides of the lock ⓐ in the direction F to unplug the head cable ④ in the direction G.

Figure E

3.3.8 Printer Mechanism

(1) Remove the upper cover (see 3.3.2).

(2) Remove the print head (see 3.3.1).

(3) Remove the control board (see 3.3.3).

(4) Remove the power supply (see 3.3.4).

(5) Remove the ribbon-feed gear assembly (see 3.3.6).

(6) Remove the space motor assembly (see 3.3.7).

(7) Remove four screws ① and washers ②.

(8) Lift the printer mechanism ③ to detach it.

(9) For reassembly, reverse the disassembly procedure.

Notes:

1. In lifting the printer mechanism ③, take care not to damage cables etc ④.

2. When reinstalling the printer mechanism, bond it, securing the space shown in figure A so as not to allow slack in it.

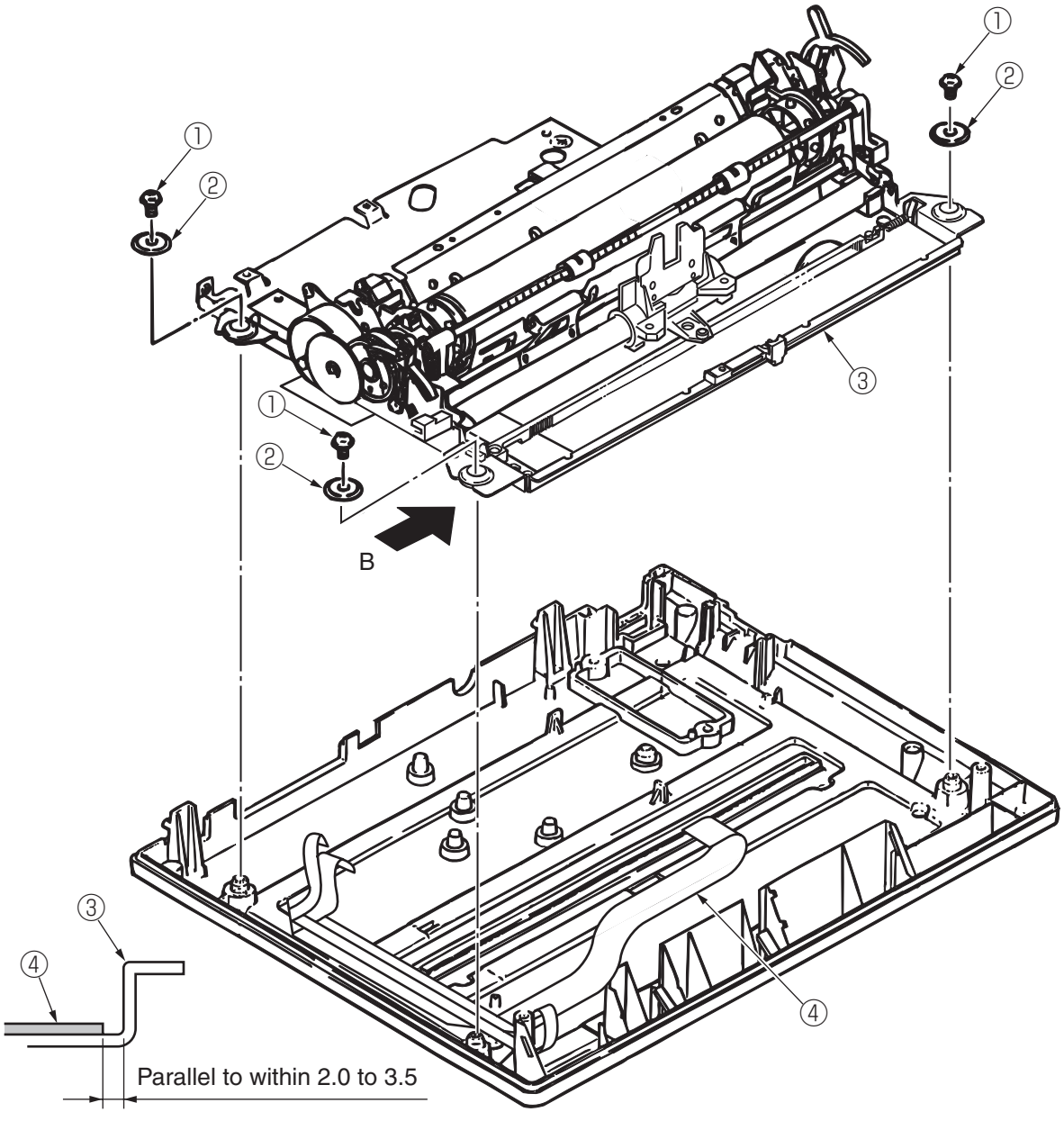


Figure A

3.3.9 LF Motor Assembly

(1) Remove the printer mechanism (see 3.3.8)

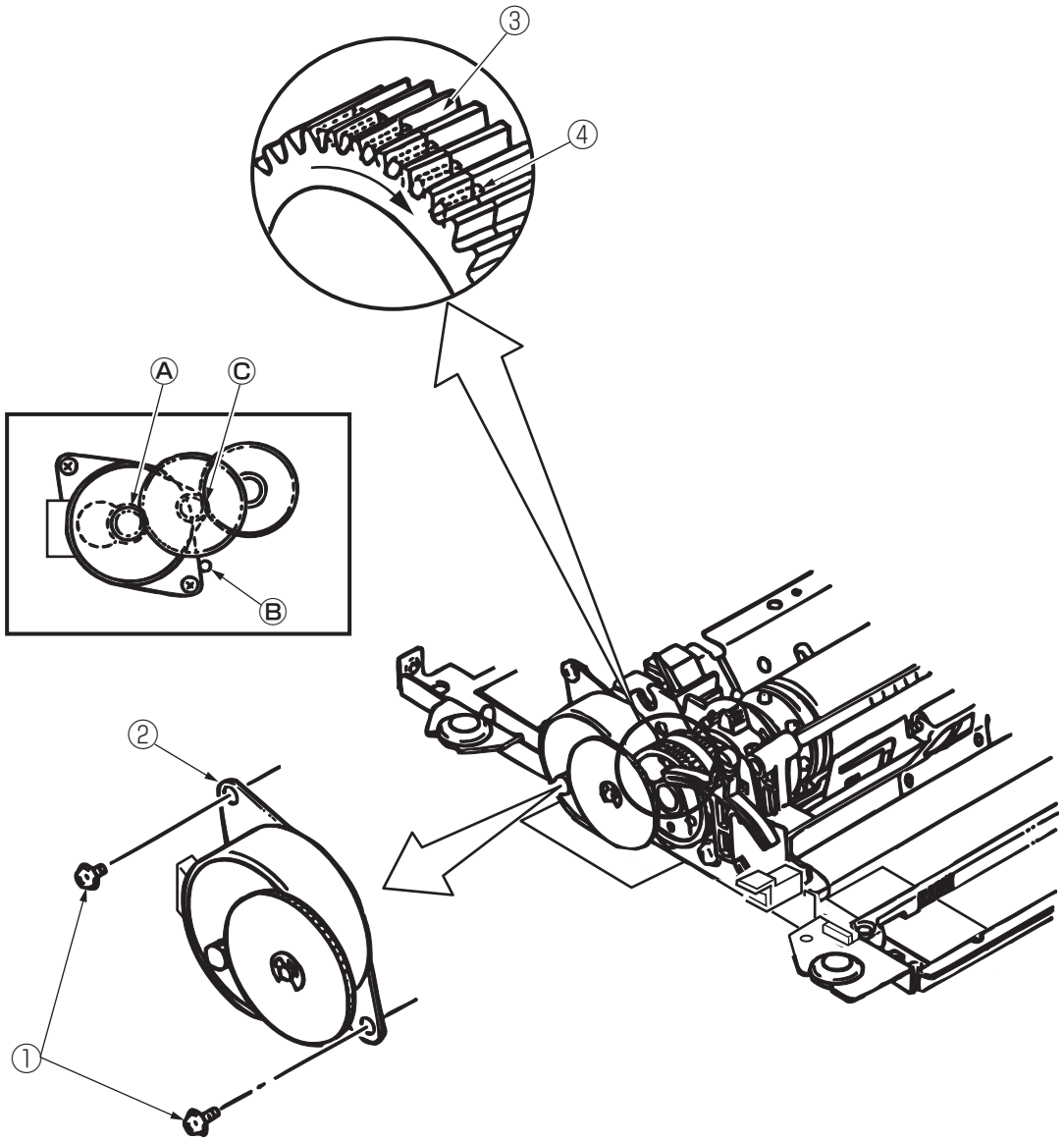
(2) Remove two screws ①.

(3) Remove LF motor assembly ②.

(4) For reassembly, reverse the disassembly procedure.

Notes:

1. *When assembling, match the teeth of platen gear ③ and bias gear ④, then engage the gear at Ⓓ. (Bias gear ④ is offset from platen gear ③ by half the width of a tooth. Turn the bias gear half a tooth width in the direction of the arrow to align two teeth.)*
2. *Install the LF motor while pressing it against Ⓐ and Ⓑ.*
3. *After assembling, make sure that the platen gear Ⓒ is correctly engaged and the platen turns smoothly.*



3.3.10 Space Rack

(1) Remove the upper cover (see 3.3.2).

(2) Remove the print head (see 3.3.1).

(3) Remove the ribbon feed gear assembly (see 3.3.6)

(4) Remove the space motor assembly (see 3.3.7).

(5) Remove spring ①.

(6) Disengage tab ②.

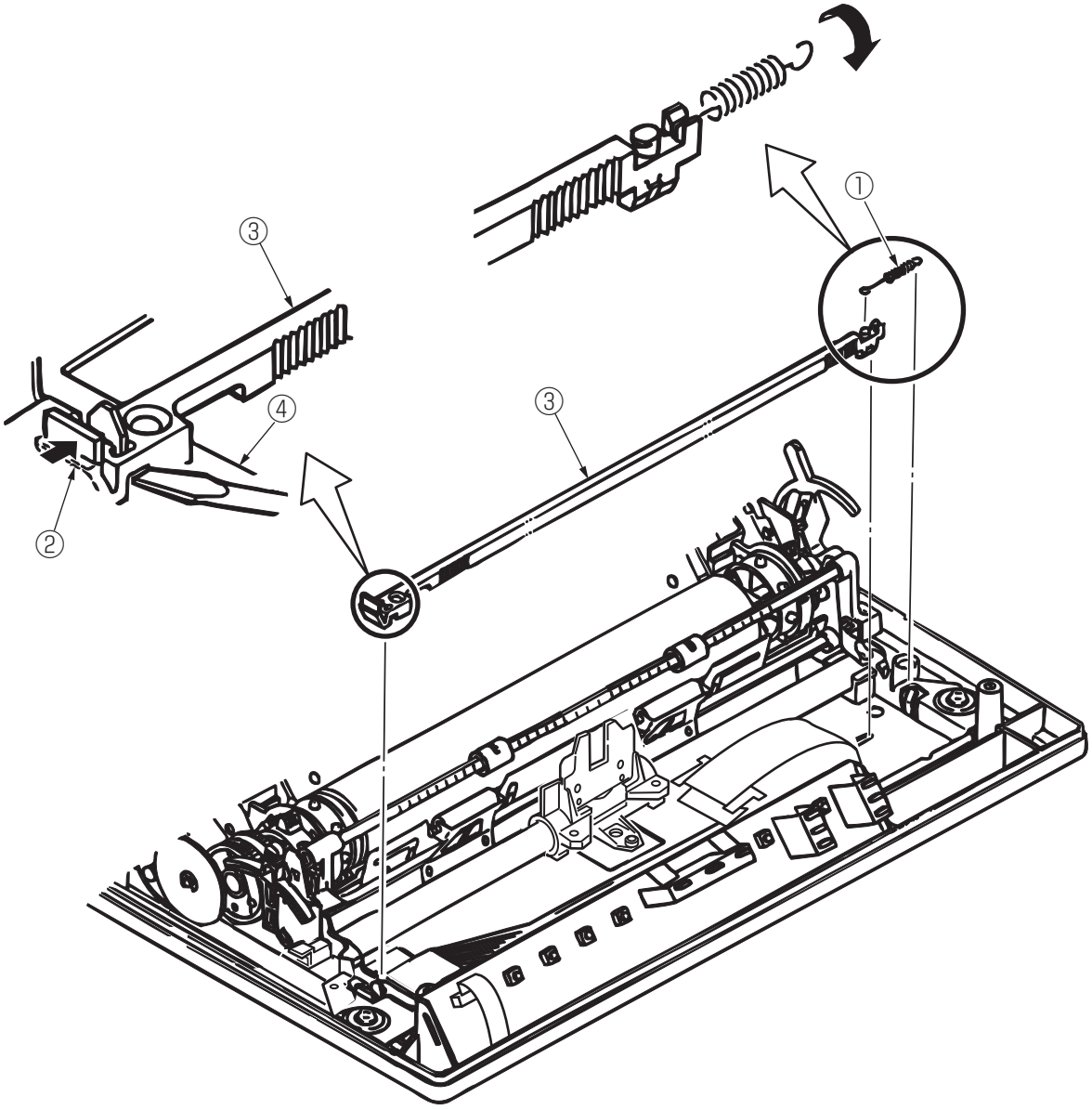
(7) Remove the space rack by inserting a flat screwdriver between space rack ③ and base frame ④ and gently lifting the space rack.

(8) For reassembly, reverse the disassembly procedure.

Notes:

1. After installing the ribbon feed fear assembly, check and adjust the gap between the platen and print head (see 4.1), Also check and adjust the gap between the space rack and roller (see 4.2).

2. When installing spring ①, twist the right end of the spring 90 degrees counter-clockwise.



3.3.11 Cable assembly

(1) Remove the printer mechanism (see 3.3.8).

(2) Detach the cable assembly ① from the lower cover ②.

Notes:

1. *Cable assembly must be replaced with ribbon-feed gear assembly (see 3.3.6), space motor assembly (see 3.3.7) and carriage frame (see 3.3.12). Cable assembly, ribbon-feed gear assembly, space motor assembly and carriage frame are all contained in maintenance kit-space motor.*
2. *When bonding the cable assembly, place it along the inner surface of the rib of the lower cover (figure A).*
3. *Make sure the carriage cable ③ is not bent.*
4. *After installing the space motor assembly, check and adjust the gap between the platen and print head (see 4.1). Also check and adjust the gap between the space rack and roller (see 4.2).*

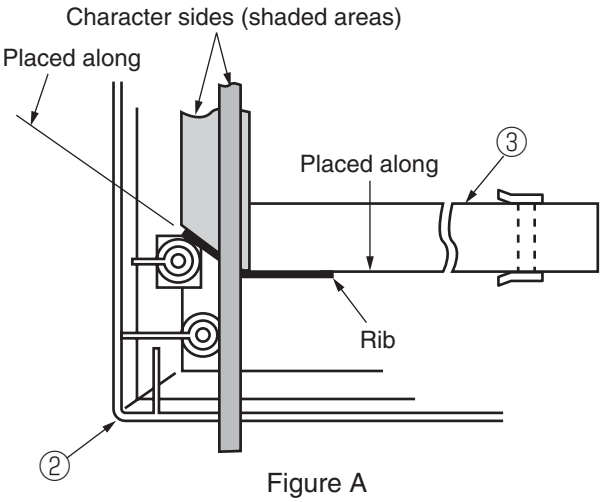
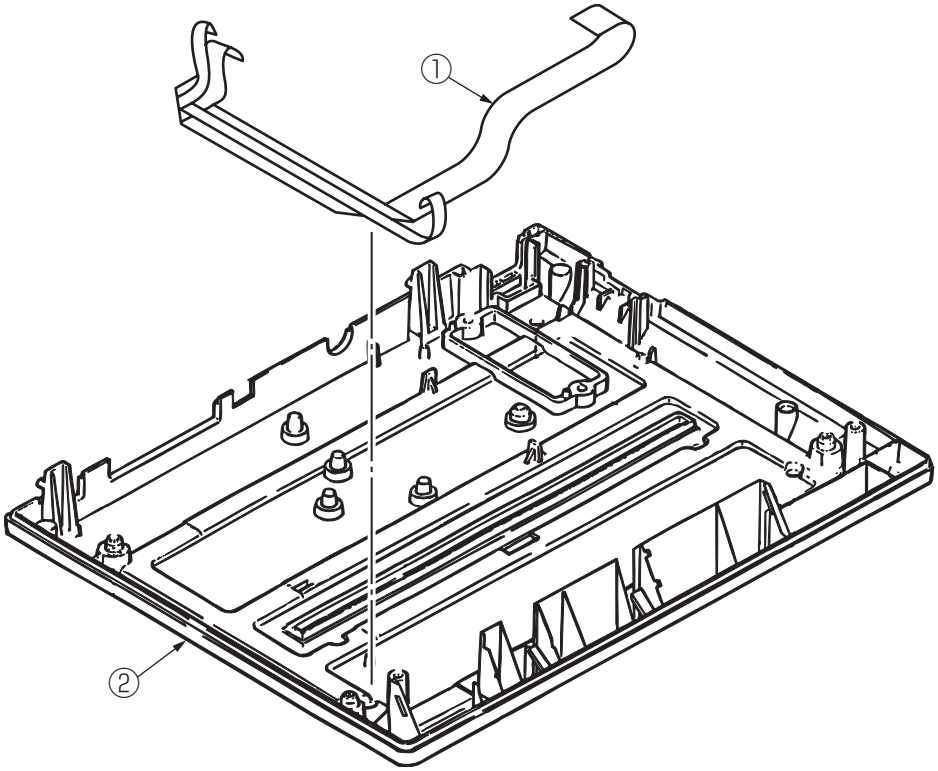


Figure A



3.3.12 Carriage Frame

(1) Remove the upper cover (see 3.3.2)

(2) Remove the printer mechanism. (See 3.3.8)

(3) Remove the column indicator bar (see 3.3.13).

(4) Remove two screws on both sides ①.

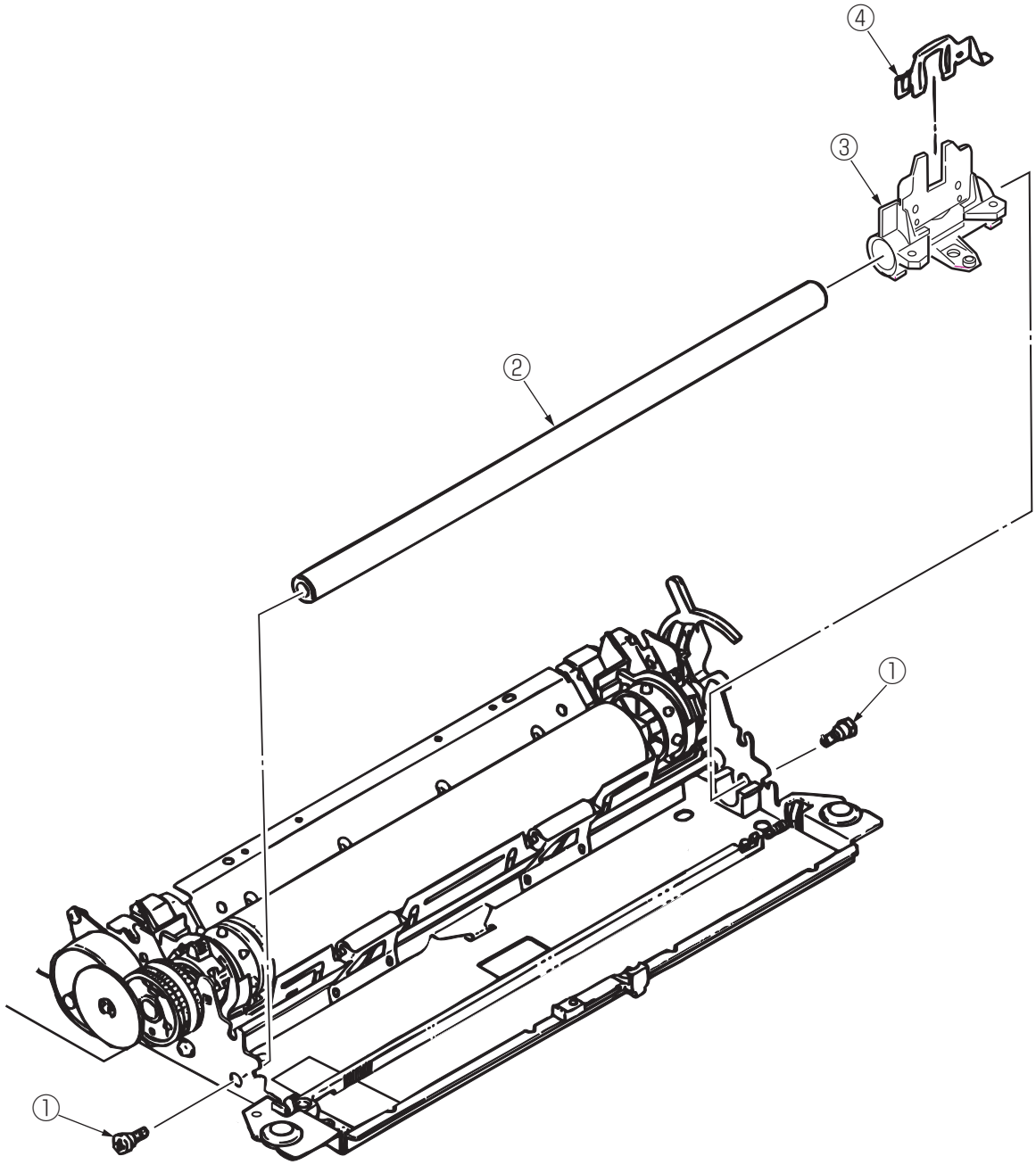
(5) Remove the carriage shaft ② together with carriage frame ③.

(6) Remove the carriage frame ③ from carriage shaft ②.

(7) Remove the head clamp ④.

(8) For reassembly, reverse the disassembly procedure.

Note: *Carriage frame must be replaced with ribbon-feed gear assembly (see 3.3.6), space motor assembly (see 3.3.7) and cable assembly (see 3.3.11). Carriage frame, ribbon-feed gear assembly, space motor assembly and cable assembly are all contained in maintenance kit-space motor.*



3.3.13 Column Indicator Bar

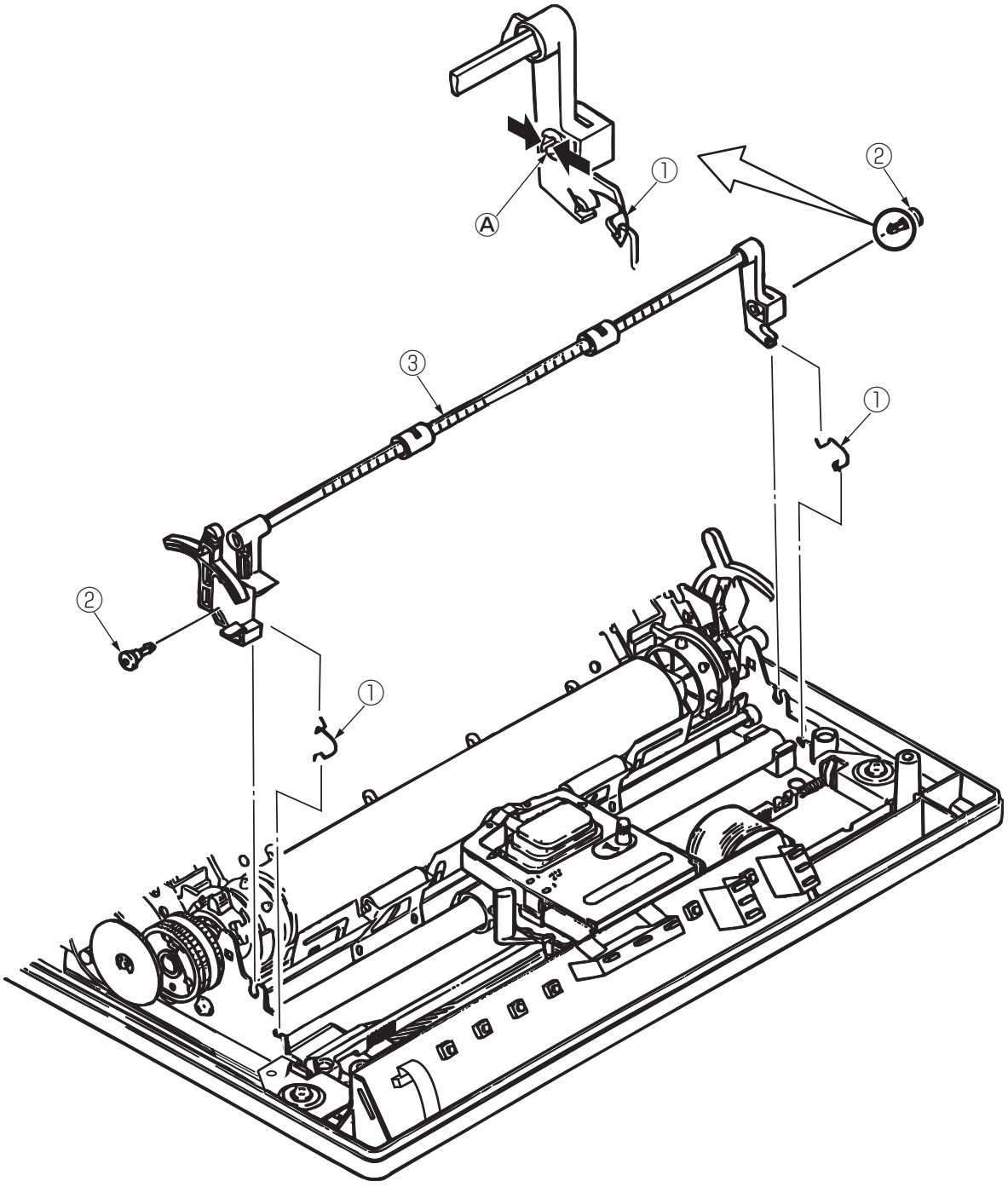
(1) Remove the upper cover (see 3.3.2)

(2) Remove two springs ①.

(3) Remove two push shafts ② by squeezing the pins Ⓐ in the direction of the arrow.

(4) Remove column indicator bar ③.

(5) For reassembly, reverse the disassembly procedure.



3.3.14 Platen Assembly

(1) Remove the upper cover (see 3.3.2).

(2) Disengage four tabs ① by gently pushing tabs from side plate Ⓑ on each side.

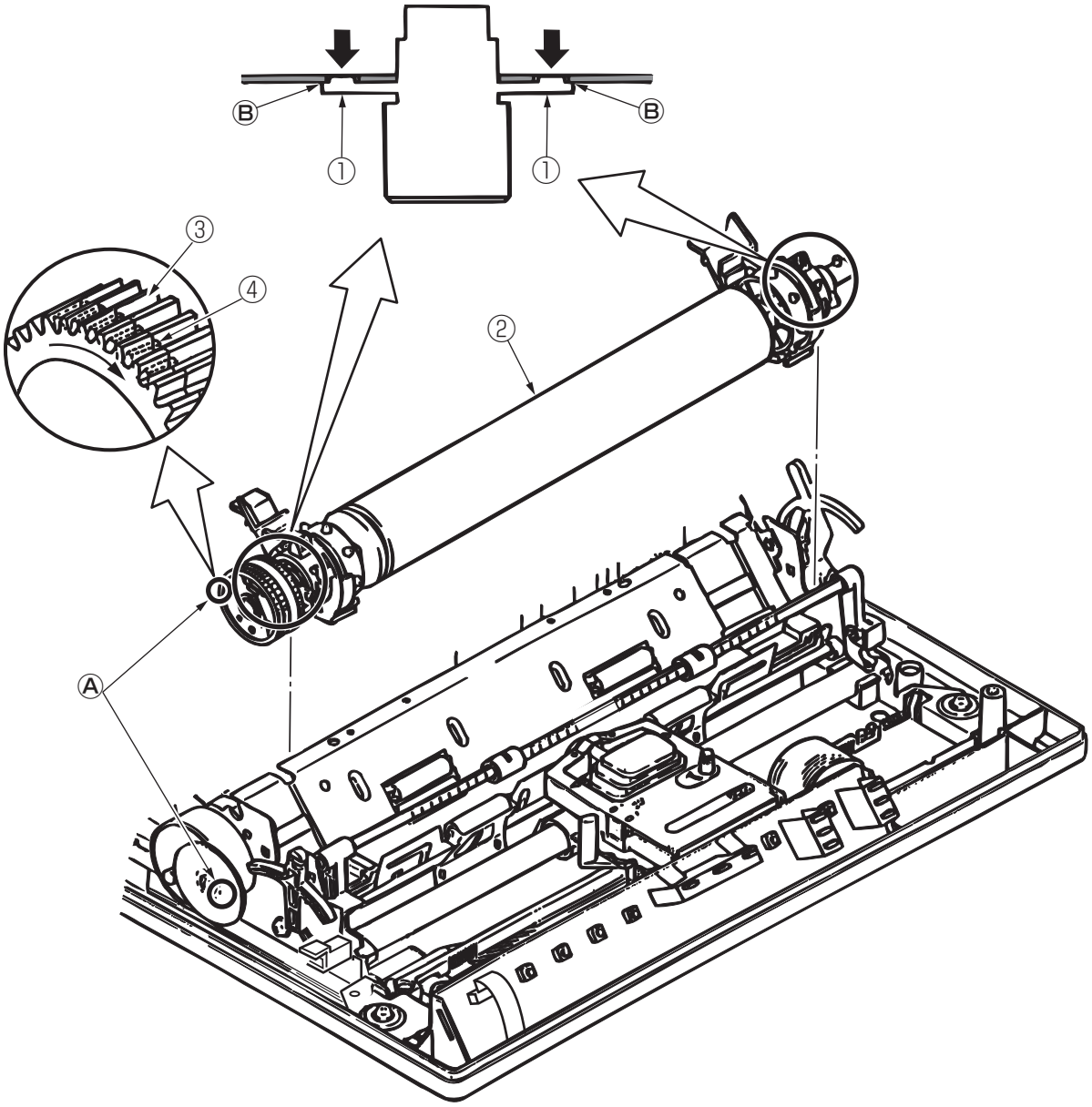
(3) Remove platen assembly ②.

(4) For reassembly, reverse the disassembly procedure.

Notes:

1. When assembling, match the teeth of platen gear ③ and bias gear ④, then engage the gear at Ⓐ. (Bias gear ④ is offset from platen gear ③ by half the width of a tooth. Turn the bias gear half a tooth width in the direction of the arrow to align two teeth.)

2. After assembling, make sure that the platen gear is correctly engaged and the platen turns smoothly.



3.3.15 Paper-chute Assembly

(1) Remove the upper cover (see 3.3.2).

(2) Remove the printer mechanism. (See 3.3.8)

(3) Remove the LF motor assembly (see 3.3.9).

(4) Remove the platen assembly (see 3.3.14).

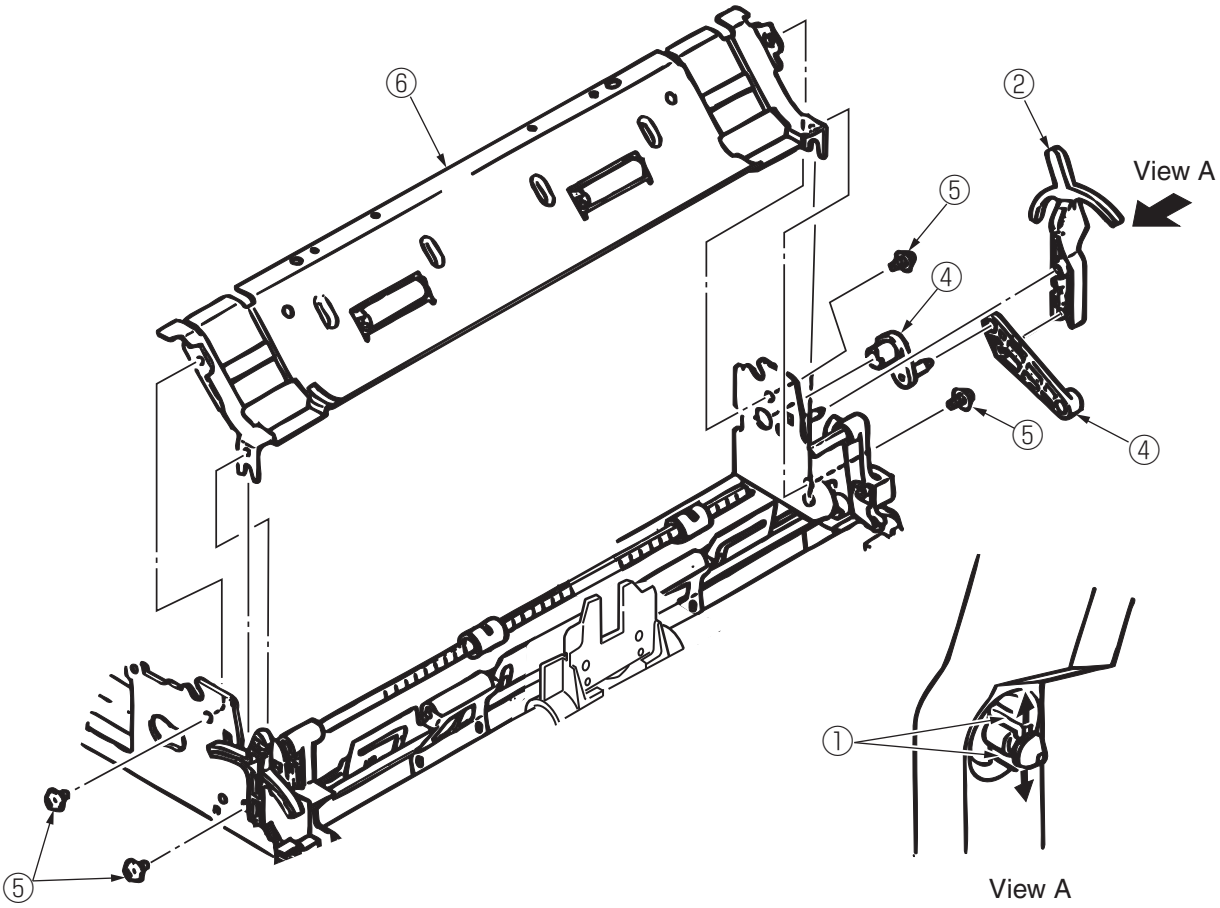
(5) Open two tabs ① with a flat screwdriver, then remove paper lock release lever ②. (Be careful with the tabs because they are very small.)

(6) Disengage middle release link ③ from rear release link ④, and remove rear release link ④.

(7) Remove four screws ⑤ (two on each side).

(8) Remove paper chute assembly ⑥.

(9) For reassembly, reverse the disassembly procedure.



3.3.16 Bottom Paper Guide Assembly

(1) Remove the upper cover (see 3.3.2).

(2) Remove the printer mechanism. (See 3.3.8)

(3) Remove the LF motor assembly (see 3.3.9).

(4) Remove the platen assembly (see 3.3.14)

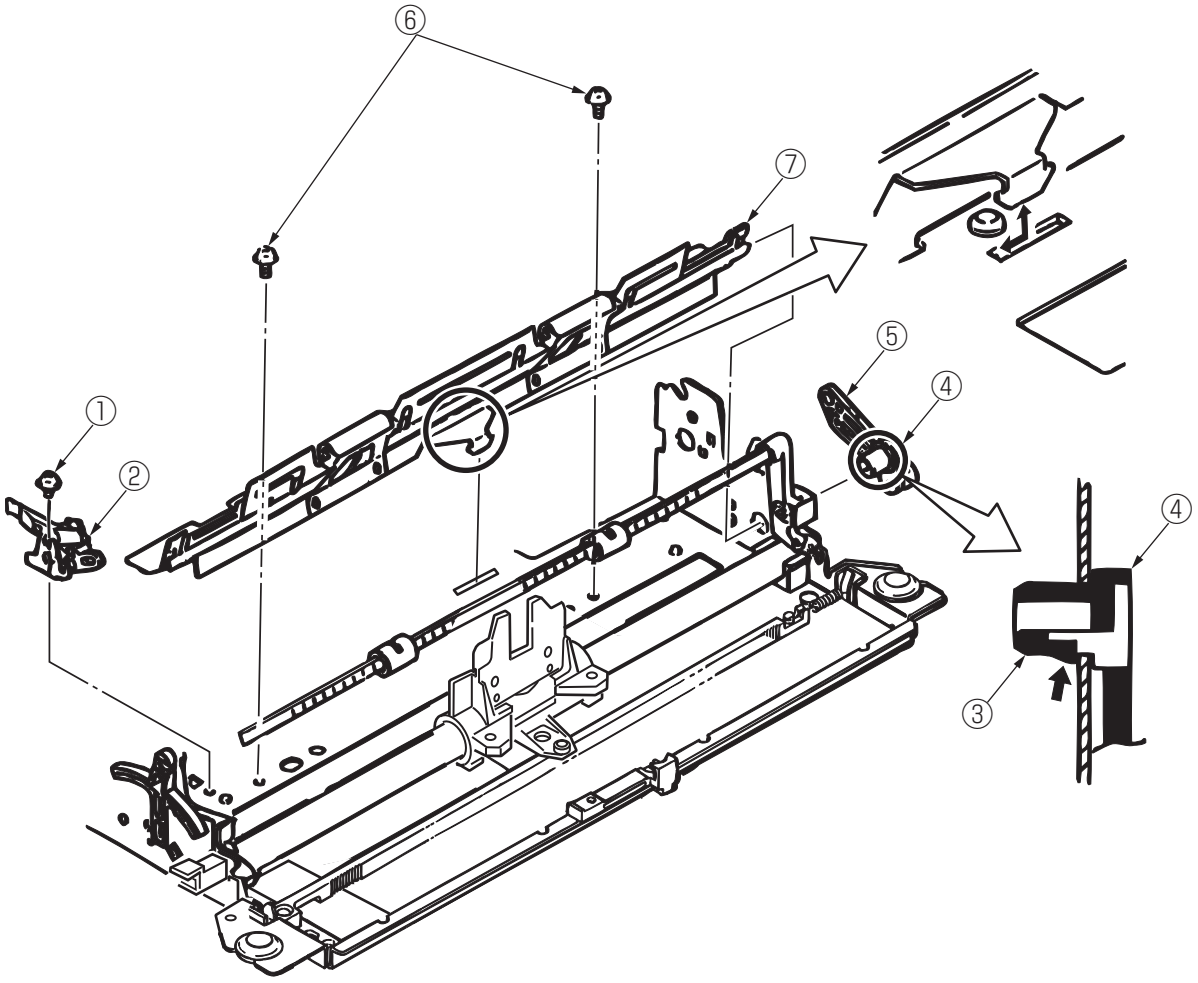
(5) Remove the paper-chute assembly (see 3.3.15).

(6) Remove screw ①, then remove near-end lever assembly ②.

(7) Close tab ③ and remove front release link ④ together with middle release link ⑤.

(8) Remove two screws ⑥ and remove bottom paper guide assembly ⑦.

(9) For reassembly, reverse the disassembly procedure.



3.3.17 Near-end Lever and Bracket

(1) Remove the upper cover (see 3.3.2).

(2) Remove the printer mechanism. (See 3.3.8)

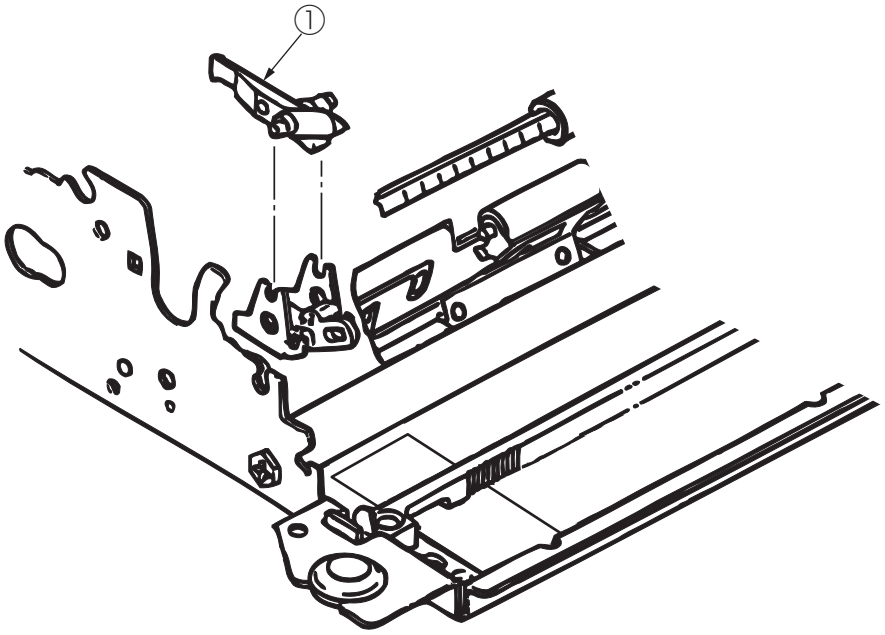
(3) Remove the LF motor assembly (see 3.3.9).

(4) Remove the platen assembly (see 3.3.14).

(5) Remove the paper-chute assembly (see 3.3.15).

(6) Remove near-end lever ①.

(7) For reassembly, reverse the disassembly procedure.



3.3.18 Bottom Near-end Lever

(1) Remove the upper cover (see 3.3.2).

(2) Remove the printer mechanism. (See 3.3.8)

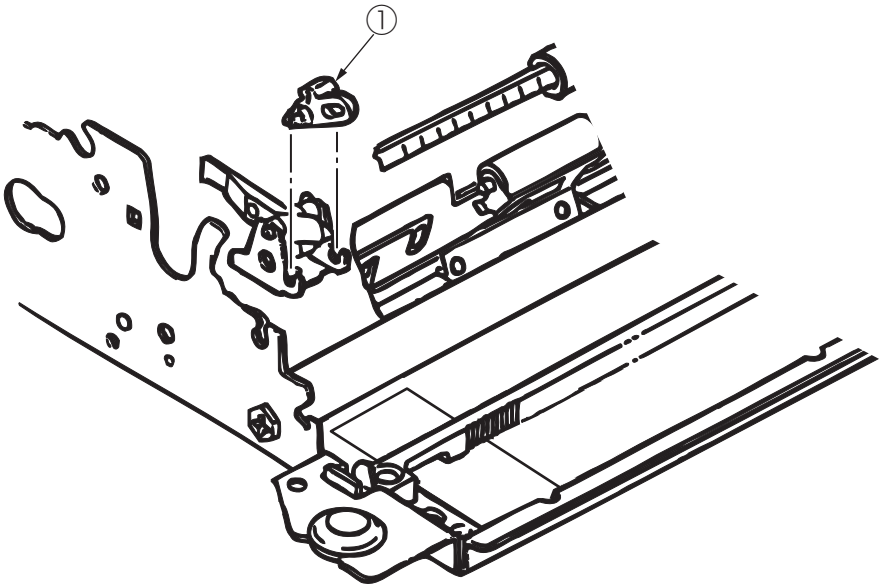
(3) Remove the LF motor assembly (see 3.3.9).

(4) Remove the platen assembly (see 3.3.14).

(5) Remove the paper-chute assembly (see 3.3.15).

(6) Remove bottom near-end lever ①.

(7) For reassembly, reverse the disassembly procedure.



3.3.19 Switch assembly

(1) Remove the upper cover (see 3.3.2).

(2) Remove the printer mechanism. (See 3.3.8)

(3) Remove the screw ①.

(4) Detach the switch assembly ②.

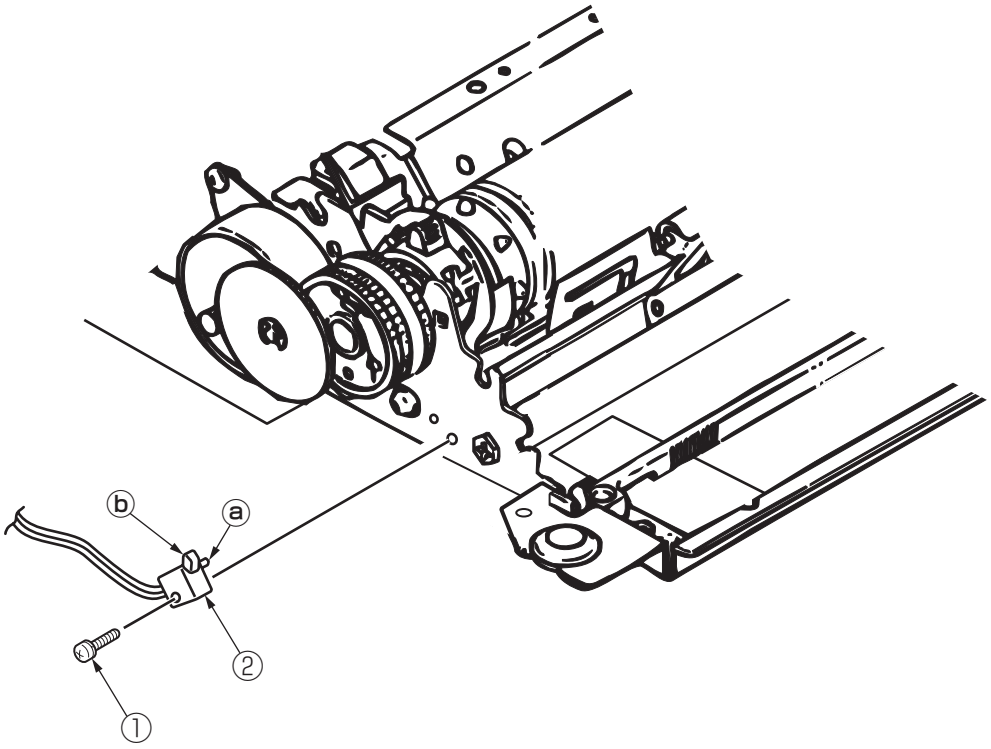
(5) For reassembly, reverse the disassembly procedure.

Notes:

1. The switch assembly should be detached or reattached with the bail lever placed in its closed position (backward).

2. Observe the orientation of the sensor lever ⓑ.

3. When reinstalling the switch assembly, be sure that the boss ⓐ of the sensor ② is aligned with the hole on the frame, and fasten it with the screw ①.



3.3.20 Pin Tractor Assemblies (R and L)

(1) Remove the sheet guide ①.

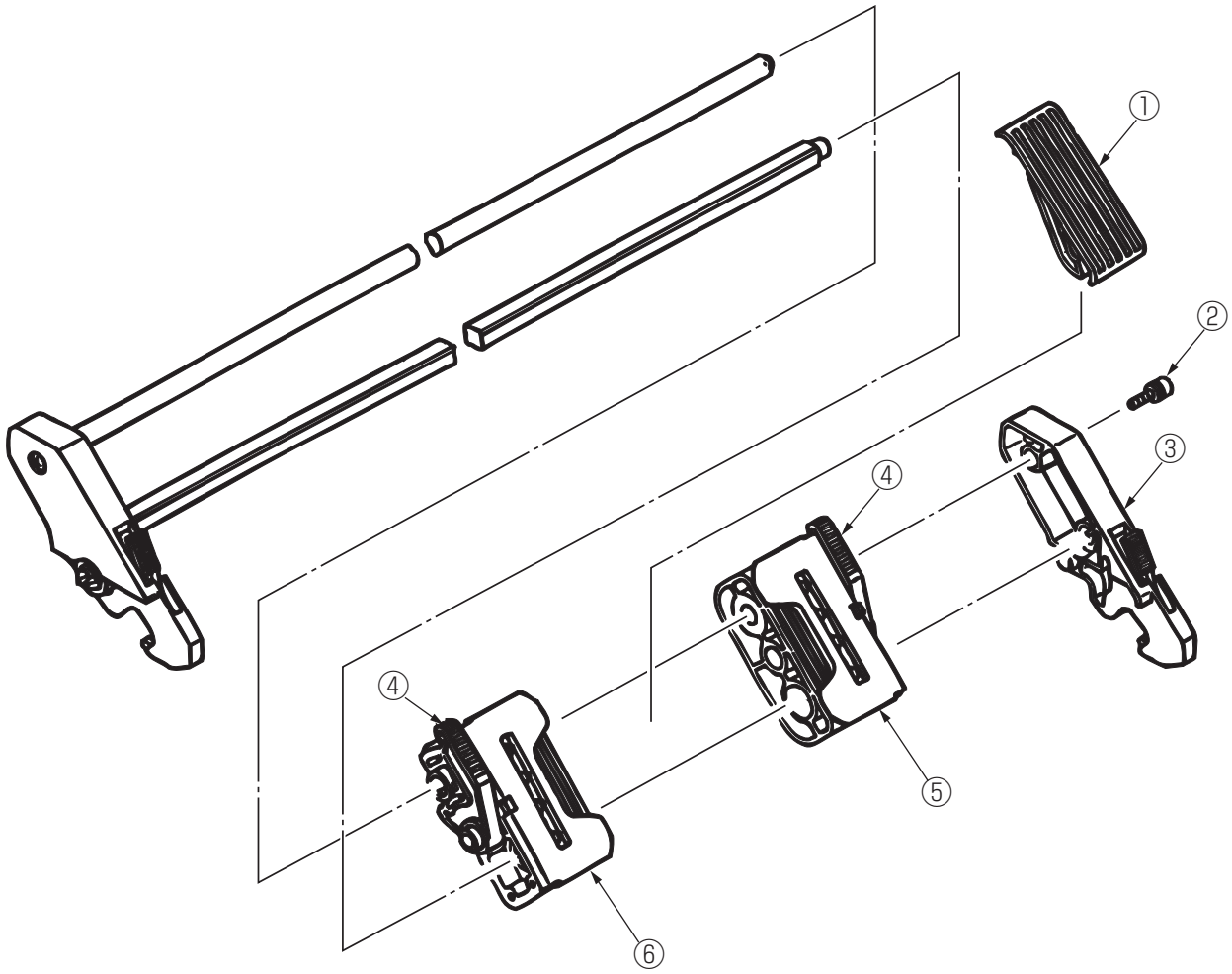
(2) Remove screw ②.

(3) Remove side frame ③.

(4) Unlock lock lever ④, and remove left ⑥ and right ⑤ pin tractor assemblies.

(5) For reassembly, reverse the disassembly procedure.

Note: *When assembling, verify that the left and right sprockets are aligned.*



4. ADJUSTMENT

4.1 Head-Gap Adjustment

Tools:
- Thickness gauge set
- Phillip's screwdriver No. 2-200
- Metal rod about 0.04 inch (1 mm) in diameter and 3 inches (76 mm) long (an extended paper clip can be used)

Adjustment procedure (see figure 4-1)

(1) Turn OFF the AC POWER switch and remove the AC plug from the AC receptacle.

(2) Remove the access cover.

(3) Remove the ribbon cartridge.

(4) Set the adjusting lever to range 1.

(5) Tilt the paper lock release lever back.

(6) Insert a 0.019-inch (0.45-mm) thickness gauge between the platen and print head. Make sure that the thickness gauge can be smoothly inserted, although there may be slight friction. Perform this operation at both ends of the platen.

(7) If gap adjustment is required, press down the adjusting gear with the metal rod to disengage the gear from the adjusting lever, and adjust the gap by turning the adjusting screw with a screwdriver.

(8) After adjustment, move the adjusting lever from position 1 to 3 to 1, then check the gap between the platen and print head once more. The gap must be between 0.0165 and 0.019 inch (0.42 to 0.48 mm).

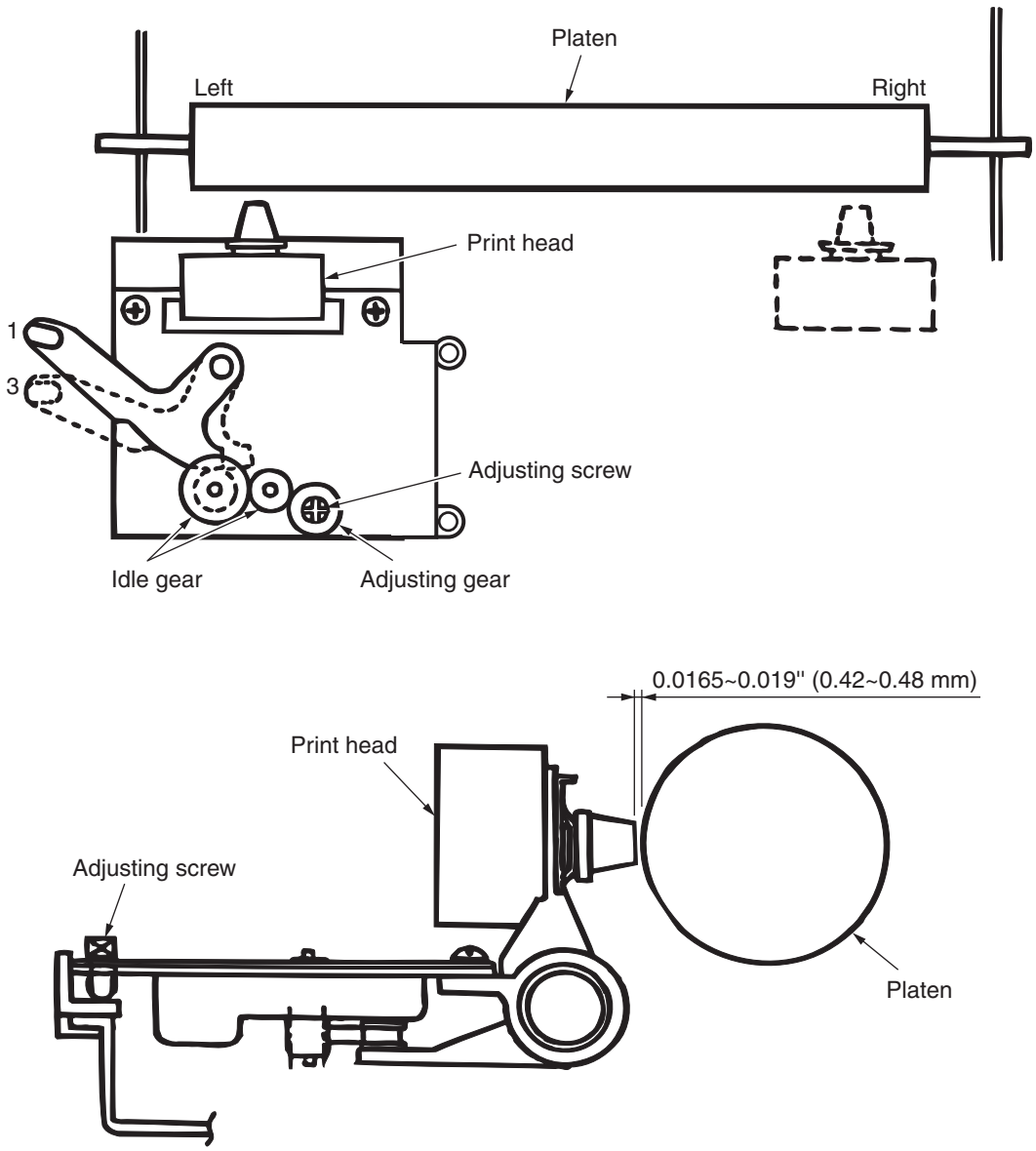


Figure 4-1 Head-Gap Adjustment

4.2 Space Rack and Roller-Gap Adjustment

Tools:
- Thickness gauge
- Phillip's screwdriver No. 2-200
- Tension guage, 250 g

Adjustment procedure

(1) Turn OFF the AC POWER switch and remove the AC plug from the AC receptacle.

(2) Remove the upper cover.

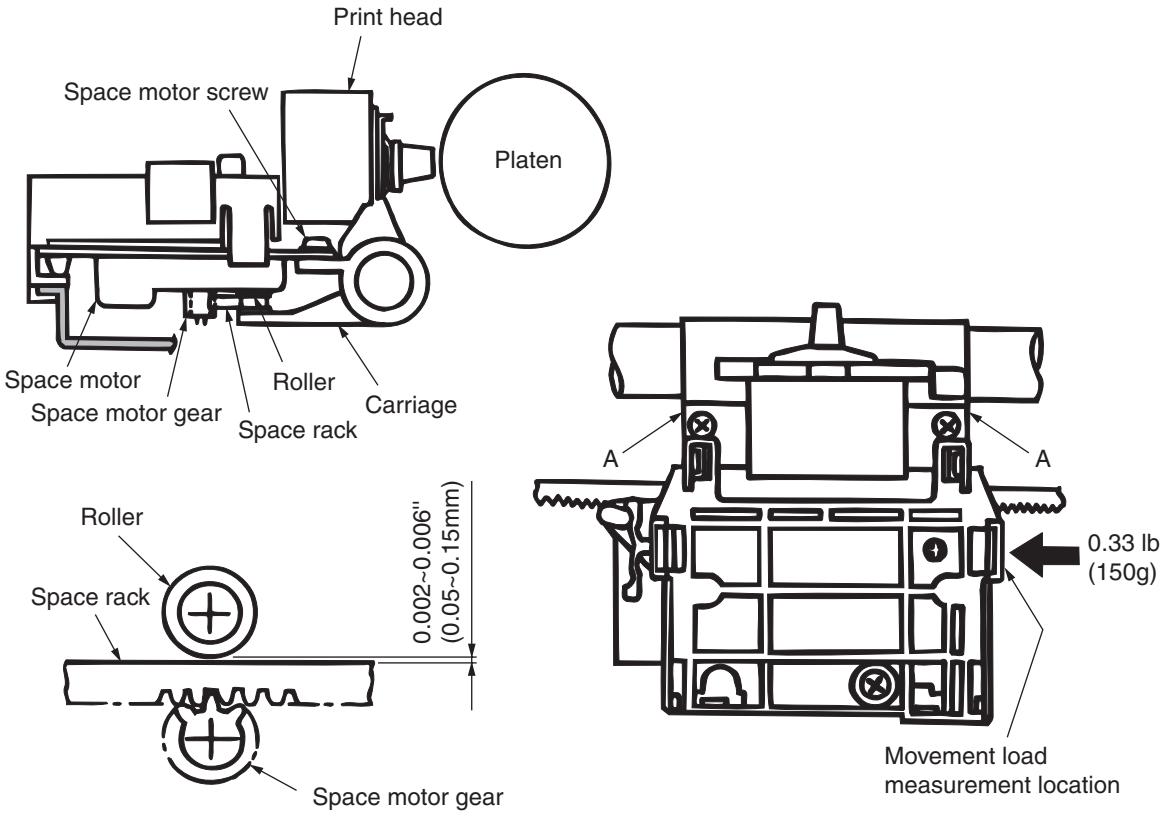
(3) Remove the ribbon cartridge.

(4) Insert a 0.1-mm thickness gauge between the space rack and roller. Make sure that the thickness gauge can be smoothly inserted, although there may be slight friction.

(5) If adjustment is required, loosen the space motor screws with a screwdriver and adjust.

Note: *Match side A with the corresponding carriage frame surface when attaching.*

(6) After adjustment, check the gap between the space rack and roller once more. The gap must be between 0.002 and 0.006 inch (0.05 to 0.15 mm). Also check that the carriage movement load without ribbon cartridge is 0.33 lb (150 g) or less.



5. CLEANING AND LUBRICATION

5.1 Cleaning

Cautions:

1. *Be sure to turn OFF the DC POWER switch before cleaning.*
2. *Be careful not to let paper lint get inside the mechanism.*

The printer should be cleaned periodically as follows:

Period: Either 6 months or 300 operating hours, whichever comes first.

Required time: Approximately 10 minutes.

Tools: Dry, soft cloth (such as gauze)(and vacuum cleaner if available)

Parts to be cleaned: See table 5-1.

Table 5-1 Parts To Be Cleaned

Parts	Description
Carriage and its surroundings	Remove paper lint, dust, dirt, and ribbon lint. Clean platen pinch rollers with cleaning fluid.
Paper path	
Paper-end sensor	Remove paper lint and dust attached to the sensor.

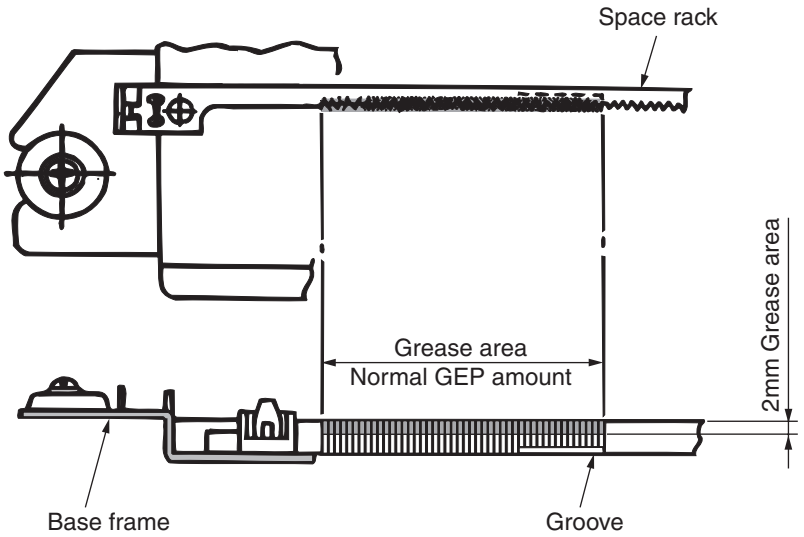
5.2 Lubrication

This printer requires no oiling during normal operation. Oiling must be performed, however, when disassembling, reassembling, after cleaning oiled parts, and after replacing parts.

Type of grease: Albania grease #2EP (Shell Oil equivalent product) GEP

Locations: See figure below.

Note: *Do not apply any grease to carriage shaft or along paper path (platen, roller, etc.).*



Space Rack Greasing Locations

6. TROUBLESHOOTING AND REPAIR

6.1 Items To Be Checked Before Repair

When there is a user request for repair, check whether the printer can be fixed by the troubleshooting procedure described in the User's Manual.

If possible, ask the user about the conditions that caused the error and make a record of the answer.

Before troubleshooting, operate the printer under the same conditions as at the time of error and see whether the error can be reproduced. If the error cannot be reproduced, run a print test and proceed with troubleshooting.

6.2 Finding the Cause of Error

First check the error condition against table 6-1. Then follow instructions in 6-3. Troubleshooting, to find the actual cause of error.

Read the precautions in 3-1 before repairing.

Figure 6-1 shows the connector locations and pin numbers. Table 6-2 shows the pin signal names. Figure 6-1 shows the Control and Operation board checkpoints.

Table 6-1 Error Conditions

Error Type	Description	Item
During POWER ON	The carriage does not move.	①
	The carriage does not move and the POWER lamp is lit.	②
	Carriage moves abnormally (runaway, vibration, or incomplete homing) and POWER lamp is lit.	③
	Homing operation is normal, but indicators are abnormal.	④
	Fuse (F1) on the AC power supply unit is blown.	⑤
	Fuse (F1) on the control board is blown.	⑥
During data receive or print	Neither spacing nor printing is performed and POWER and SELECT lamps are lit (parallel interface).	⑦
	Spacing is normal, but does not print.	⑧
	Printing stops.	⑨
	Wrong characters printed or some characters not printed.	⑩
	Some dots not printed.	⑪
	Print is too light.	⑫
	Line feed not performed.	⑬
	Fuse (F1) on power supply unit is blown.	⑭
	Switch on the operation panel does not work. (Carriage moves to home at power on.)	⑮
	Neither spacing nor printing is performed and POWER and SELECT lamps are lit (USB interface).	⑯

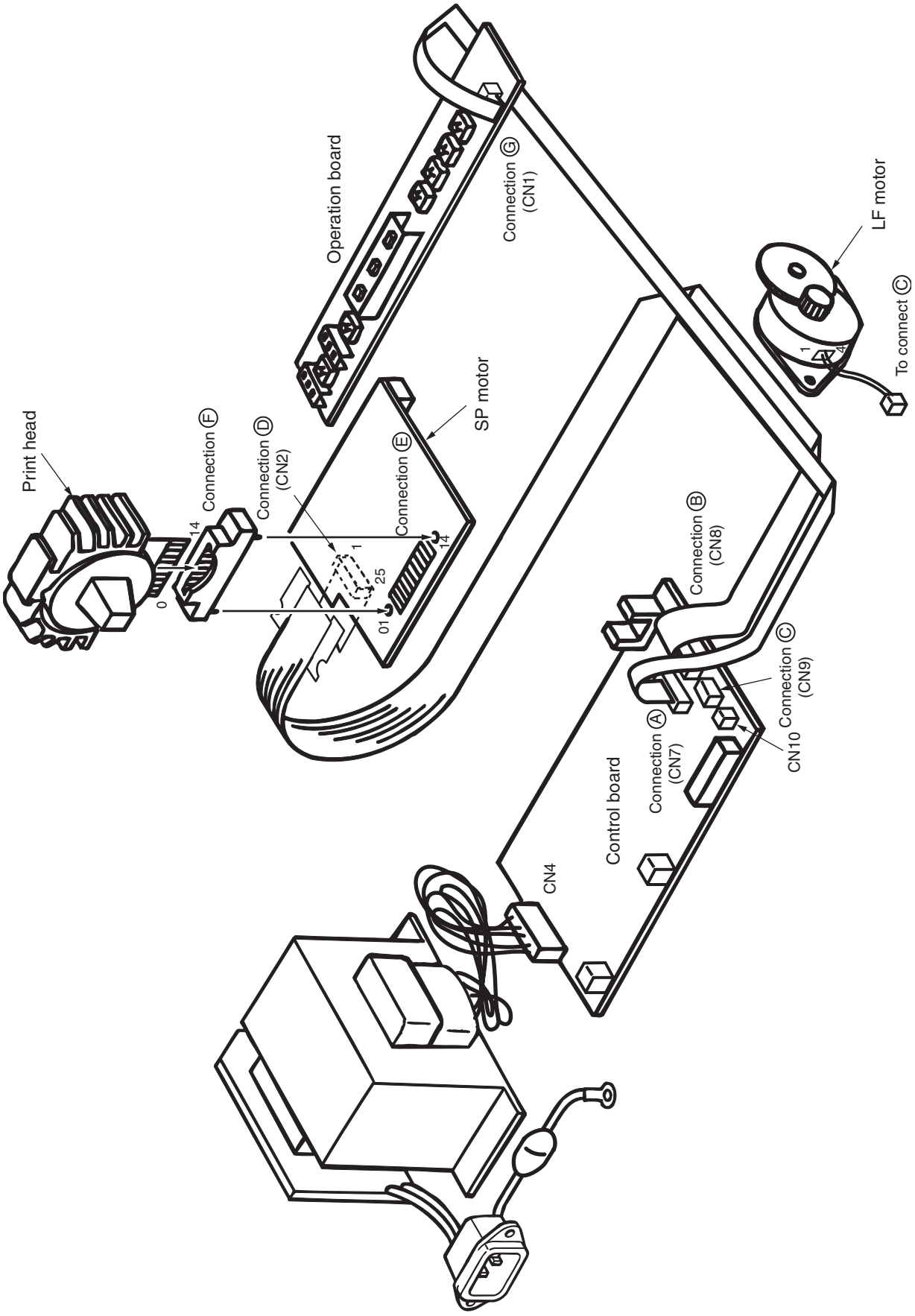
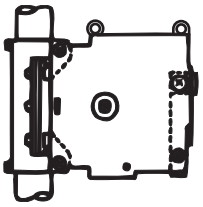
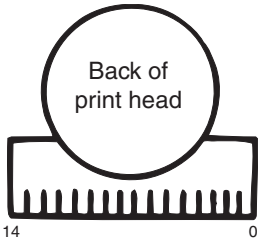
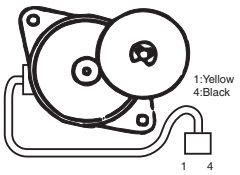
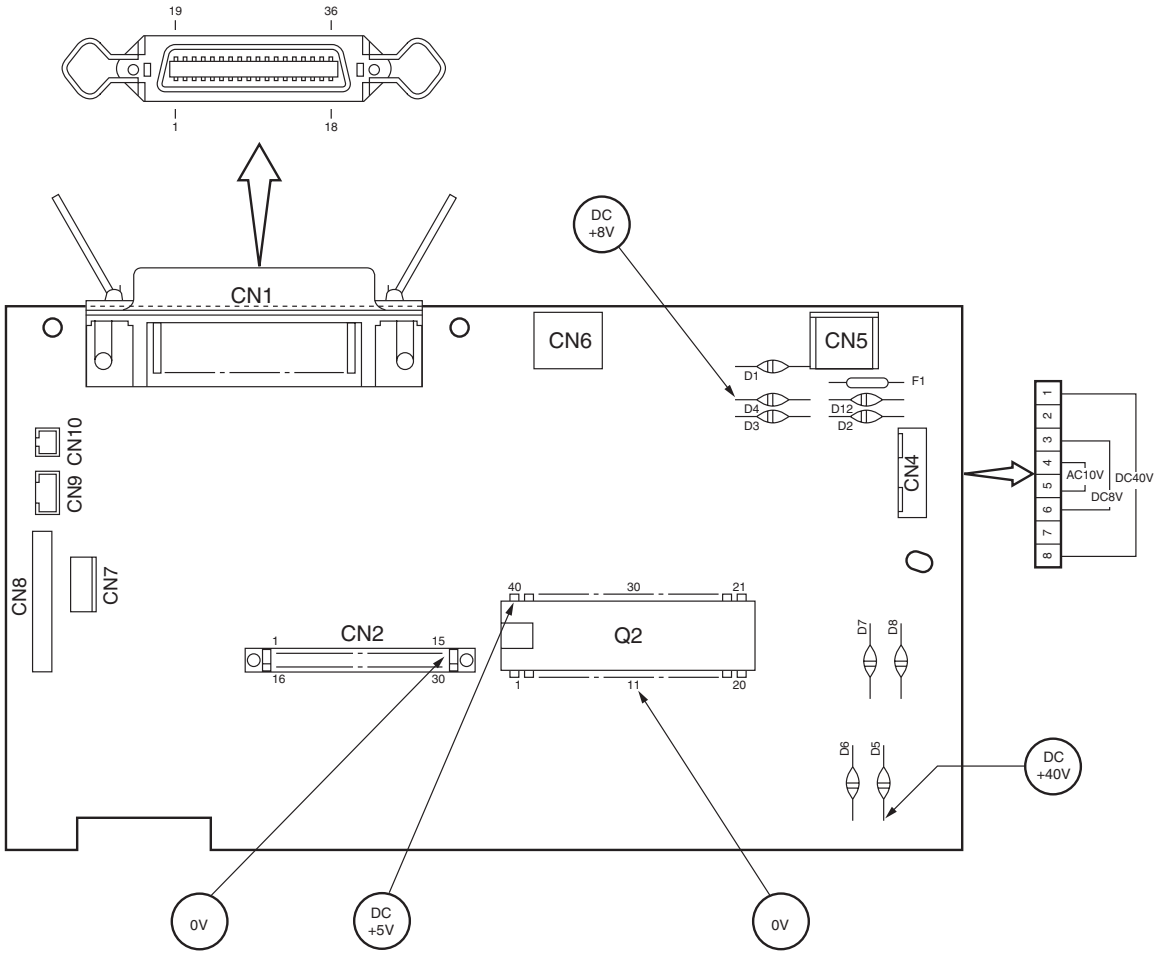


Figure 6-1 Connector Locations and Numbers of pins

Table 6-2 Pin Numbers and signal Names

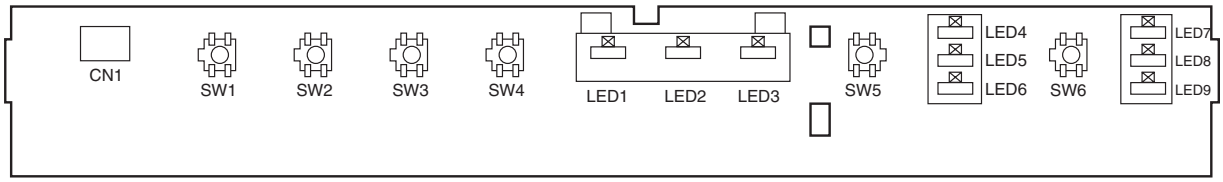
Name	Signal Name	Connection							Coil Re-sistance	Figure
		A(CN7)	B(CN8)	C(CN9)	D(CN2)	E	F	G(CN1)		
SP MOTOR	SPV		A18, B18		A8, B8				Approx. 21Ω	
	SPU		A19, B19		A7, B7					
	SPW		A20, B20		A6, B6					
	PHASEA		A24, B24		A2, B2					
	PHASEB		A23, B23		A3, B3					
PRINT HEAD	HEAD1		A17, B17		A9, B9	14	14		Approx. 20Ω	
	HEAD2		A16, B16		A10, B10	13	13			
	HEAD3		A2, B2		A24, B24	1	1			
	HEAD4		A15, B15		A11, B11	12	12			
	HEAD5		A3, B3		A23, B23	2	2			
	HEAD6		A14, B14		A12, B12	11	11			
	HEAD7		A4, B4		A22, B22	3	3			
	HEAD8		A13, B13		A13, B13	10	10			
	HEAD9		A5, B5		A21, B21	4	4			
	40V(Common)		A6, B6, A7, B7, A8, B8, A9, B9, A10, B10		A20, B20, A19, B19, A18, B18, A17, B17, A16, B16	5, 6, 7	5, 6, 7			
	HEAD ALM (Head Temp)		A11, B11		A15, B15	8	8			
	0V		A12, B12		A14, B14	9	9			
LF MOTOR	A1			1					Approx. 12.6Ω	
	A2			2						
	B1			3						
	B2			4						
OPER-ATION PANEL	5V	3						5		
	0V	2						6		
	FG	1						7		
	OPCLR	7						1		
	OPRXD	6						2		
	OPCLK	5						3		
	OPTXD	4						4		

- Control Board



- Operation Board

SW1...LINE FEED SW3...TOF SET SW5...PITCH
SW2...FORM FEED SW4...SELECT SW6...MODE



LED1...SELECT LED4...10 LED7...NLQ
LED2...ALARM LED5...12 LED8...UTILITY
LED3...POWER LED6...17 LED9...HSD

Figure 6-2 Check points for Printed Circuit Boards

6.3 Troubleshooting

① Power is on, but carriage does not move.

- Is POWER LED (LED3) lit?

NO YES

- to step ②.

- Is AC power supplied to AC power supply unit?

YES NO

- Replace the AC cable assembly.

YES

- Is fuse F1 of power supply unit blown?

NO YES

- Replace fuse F1 of power supply unit. If it blows again proceed to ⑤.

- Replace the AC power supply unit.

- Is +8 VDC output?

YES NO

- Is there a DC 8V difference between CN4 pin 3 and pin 5?

YES NO

- Replace the AC power supply unit.

- Is fuse F1 on Control board blown?

YES NO

- Replace the Control board.

- Replace fuse F1 on Control. If it blows again proceed to ⑥.

- Is +5 VDC output?

NO YES

- to step 4-a

- Replace the Control board.

② The Power LED lights when power is turned on, but the carriage does not move.

- Are the ALARM LED (LED2) and SELECT LED (LED1) lit?

NO YES

- Replace the Control board.

- Is the carriage easily moved by hand when the power is turned off?

YES NO

(2-a)
- Remove the ribbon cassette.
- Does the carriage move smoothly?

NO YES

- Replace the ribbon cassette.

- Remove the ribbon feed gear assembly (see 3.3.6).
- Does the gear move smoothly?

NO YES

- Replace ribbon gear feed assembly (see 3.3.6).

- Is space rack OK?

YES NO

- Replace the space rack (see 3.3.10).

- Replace the space motor assembly (see 3.3.7).

- Is +40 V output?

YES NO

- Replace the AC transformer or the Control board.

- Turn off the power and check each resistance between A18 and A19, A18 and A20, and A19 and A20 pins at the Control board CN8 (connector Ⓑ).

Note: *Be careful not to damage the copper foil on the connection board when measuring the resistance.*

- Is the resistance approximately 21 ohms?

YES NO

- to step (2-1)

- Replace the Control board.
- Is the printer normal?

YES NO

- Replace the space motor assembly (see 3.3.7).

- END

(2-1)

- Is the head cable fitted to CN8 securely?

YES NO

- Re-fit the head cable.

- Is the head cable fitted to the connector of the SP motor?

YES NO

- Re-fit the head cable.

- Is carriage cable broken?

NO YES

- Replace the carriage cable (see 3.3.11).

- Remove the ribbon cassette and ribbon feed gear assembly. Check the resistance of space motor at connection Ⓓ (see Figure 6-1).
- Is the resistance approximately 21 ohms?

YES NO

- Replace the space motor assembly (see 3.3.7).

- Replace the Control board.

③ **Carriage movement is abnormal (runaway, vibration, incomplete homing) when the power is turned on.**

- Runaway?

NO YES

- Replace the Control board.

- Vibration

YES NO

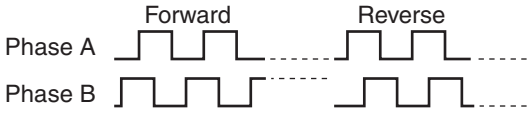
- Is +40 V output?

YES NO

- Replace the Control board or the AC power supply unit.

- to step C

- Are phase A, B signals output to Q3-15, 16?



YES NO

A • Is the head cable fitted to CN8 securely?

YES NO

- Re-fit the head cable.

- Is the ribbon feed assembly attached correctly?

YES NO

B • Reassemble.

- Is carriage cable broken?

NO YES

- Replace the carriage cable (see 3.3.11).

- Replace the space motor assembly (see 3.3.7).

C • Replace the Control board.

- Is printer normal?

YES NO

- Is the carriage easily moved by hand when the power is off?

YES NO

- to step (2-a)

- to step A

- END

④ **Homing operation is normal, but the indicators (LED1 to LED9) are abnormal when power is turned on.**

- Is POWER LED (LED3) lit?

YES NO

(4-a) • Is +5 V applied to the anode of POWER LED?

YES NO

• Correct connection at Ⓐ and Ⓖ.

• Replace the Operation board.

- Is the ALARM LED (LED2) lit?

YES NO

• to step (4-1)

- Is paper installed?

YES NO

• Install paper.

- Is the near-end lever obstructing the PE sensor?

YES NO

• Replace the Control board.

- Reset or replace the near-end lever.

(4-1)

- Is SELECT LED (LED1) lit?

NO YES

• to step (4-b)

- Is paper installed?

YES NO

• Install paper.

- Is the printer in SELECT status?

YES NO

• Press the SELECT switch (SW4).

(4-b) Are 10 (LED4) or 12 (LED5) or 17 (LED6) and NLQ (LED7) or UTILITY (LED8) or HSD (LED9) lit?

YES NO

• Replace the Control board.

- Is +5 V applied to the anode of each LED?

YES NO

• Correct connections at Ⓐ and Ⓖ.

• Replace the Operation board.

⑤ Fuse F1 on AC power supply unit blows when power is turned on.

- Is the fuse properly rated?

YES NO

- Replace the fuse with properly rated fuse.

↓

- Remove connector CN4 and turn on the power.
- Does the fuse blow again?

YES NO

- Replace the Control board.

↓

- Replace the AC power supply unit and turn on the power.

⑥ Fuse F1 on the control board blows when power is turned on.

- Is the fuse properly rated (3 A)?

YES NO

- Replace the fuse with properly rated fuse.

↓

- Replace the Control board.

⑦ Neither spacing nor printing performed while receiving data (parallel interface).

- Verify that data is being sent to the printer.
- Is SELECT LED (LED1) lit?

YES

NO

- to step (4-1)

- Are the signal levels at CN1 as shown in the table below with the interface cable removed?

Signal Level	
Pin 10	H
Pin 11	L
Pin 12	L
Pin 13	H
Pin 14	H

NO

YES

- Are parallel data signals (pins 2 to 9) and STB (pin 1) received with the cable connected?

YES

NO

- Is the interface cable connected correctly?

YES

NO

- Correct the interface cable connection.

- Replace the interface cable.

- Is self-test possible? (Perform with the interface cable removed.)

YES

NO

- Replace the Control board.

- Replace the Control board.

- Replace the Control board.

⑧ Spacing is normal, but nothing is printed while receiving data.

- Replace the print head.
- Is printer operation normal?

YES NO

(8-a)
- Turn off the power, remove the Control board, and check the resistance between pins A6, B6, A7, B7,A8, B8, A9, B9, A10, B10 and A2, B2, A3, B3,A4, B4, A5, B5, A13, B13, A14, B14, A15, B15, A16, B16, A17, B17 at CN8 (connection board side) of connection Ⓐ. (see table 6-2.)***(Note)***
- Is the resistance approximately 20 ohms?

YES NO

- Is the cord clamp of connection Ⓑ and Ⓓ firmly attached?

YES NO

- to step F

- Is the ribbon feed assembly correctly attached?

YES NO

F • Attach correctly.

- Is the carriage cable broken?

NO YES

- Replace the carriage cable (see 3.3.11).

- Is the print head connector deformed?

NO YES

- Replace the connector.

- Verify that contacts at connections Ⓑ, Ⓓ, Ⓔ, and Ⓕ, are not damaged or worn.

- Replace the Control board.

- END

Note: *Be careful not to damage the copper foil on the Control board when measuring the resistance.*

⑨ Printing stops due to an ALARM while receiving data and printing.

- Is the ALARM lamp (LED2) lit?

YES NO

- Wait until the print head cools.

- Is the SELECT LED flickering?

YES NO

- Paper near end. Refill paper.

- Is paper installed correctly?

YES NO

- Install paper correctly.

- Turn off the power and manually move the carriage.
- Does the carriage move smoothly?

YES NO

- to step (2-a)

- Is homing performed properly?

NO YES

- Replace the space motor or the Control board.

- Check items (1) to (3).

⑩ Wrong characters are printed or some characters are missing.

- Is interface cable connected properly?

YES NO

- Connect cable properly.

- Does self-test print normally?

YES NO

- Replace the Control board.

- Is the bit length set properly?

YES NO

- Set the data bit length properly.

- Are data signals 1 to 8 input normally from host to CN1 pins 2 to 9?

YES NO

- Replace the interface cable.

- Replace the Control board.

⑪ Some dots are missing.

- Remove the print head.
- Is any pin broken?

NO YES

- Replace the print head.

- Check the resistance of print head coil at connection Ⓕ. (See table 6-2.)
- Is the resistance approximately 20 ohms?

YES NO

- Replace the print head.

- To step (8-a)

⑫ Print is light.

- Is the ribbon fed properly?

YES NO

- Does the ribbon feed mechanism work properly when removing the ribbon cassette?

YES NO

- Replace the ribbon feed gear assembly (see 3.3.6).

- Replace the ribbon cartridge.

- Is the ribbon wear excessive?

NO YES

- Replace the ribbon cartridge.

- Is the print head gap set correctly?

YES NO

- Adjust the print head gap (see 4.1).

- Is +40 V output?

YES NO

- Replace the Control board or the AC transformer.

- Replace the print head.
- Is printer operation normal?

YES NO

- Replace the Control board.

- END

⑬ Line feed is not performed

- Is paper installed correctly?

YES NO

- Install paper correctly.
  (When single sheet is used the friction lever must be set to closed position.)

- Is the platen unusually hard to turn manually with the power off?

NO YES

- Adjust the paper feed mechanism. (Check for paper jam and damaged parts.)

- Turn off the power and measure each resistance between 1 and 2, and 3 and 4 at CN9.

- Is the resistance approximately 12.6 ohms?

YES NO

- Is the connector fitted securely?

YES NO

- Re-fit the connector.

- Replace the LF motor (see 3.3.9).

- Replace the Control board.
- Is printer operation normal?

YES NO

- Replace the LF motor (see 3.3.9).

- END

Note: *Be careful not to damage the copper foil on the Control board when measuring the resistance.*

⑭ Fuse F1 on power supply unit blows while receiving data and printing.

- Is the fuse properly rated?

YES NO

- Replace with properly rated fuse.

↓

- Turn off the power and check the print head coil, SP motor, and LF motor resistance. (See table 6-2.)
- Is the print head resistance approximately 20 ohms?

YES NO

- Replace the print head. Connect connections Ⓑ, Ⓓ, Ⓔ and Ⓕ properly.

↓

- Is the SP motor resistance approximately 21 ohms?

YES NO

- Replace the SP motor. Connect connections Ⓑ and Ⓓ properly.

↓

- Is the LF motor resistance approximately 12.6 ohms?

YES NO

- Replace the LF motor. Connect connections Ⓒ properly.

↓

- Replace the Control board.

⑮ Switch on the operation panel does not work (Carriage returns to home position when power is turned on).

- Are connection Ⓐ and Ⓖ proper?

YES NO

- Correct the connections.

↓

- Replace the Operation board.

⑯ Neither spacing nor printing performed while receiving data (USB interface).

- Verify that data is being sent to the printer.
- Is SELECT LED (LED1) lit?

YES

NO

- to step (4-1)

- Are the signal levels at CN6 as shown in the table below with the interface cable connected.

	Signal Level
Pin 1	+5V
Pin 3	+3.3V

NO

YES

- Are USB data signals received with the cable connected?

YES

NO

- Replace the interface cable.

- Replace the Control board.

- Is the interface cable connected correctly?

YES

NO

- Connect the interface cable correctly.

- Replace the Control board or interface cable.

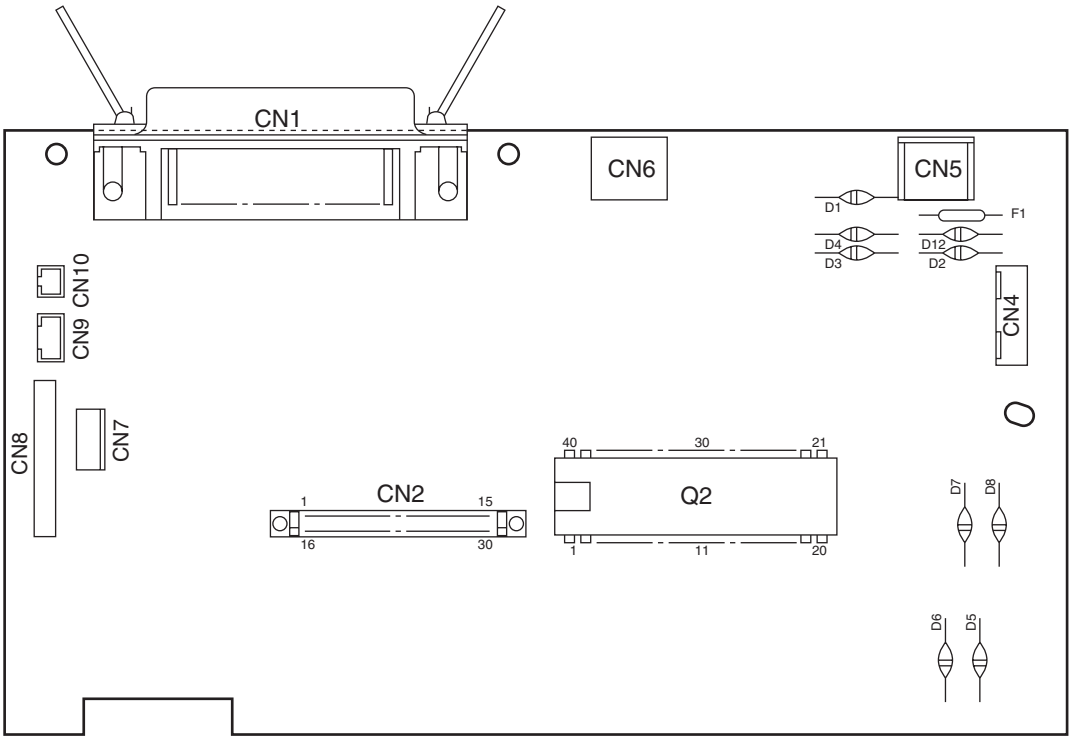
APPENDIX A PCB LAYOUT

(1) Control Board (Main Controller)

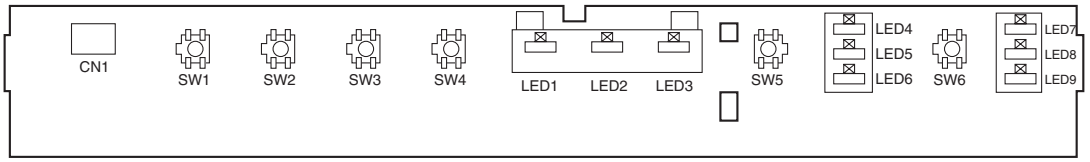
(2) Operation Board (Operator Panel)

(3) RS232C Board (Option)

- Control Board



- Operation Board



- RS232C Board